Primary 4
Teacher Edition

Originally stood
146.5 meters
About 2,299,960
blocks of stone
Stones have average
mass of about 2,300 kg

MINISTRY OF EDUCATION AND TECHNICAL EDUCATION

Math Term 2

Part 1

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FOREWORD

This is a pivotal time in the history of the Ministry of Education and Technical Education (MOETE) in Egypt. We are embarking on the transformation of Egypt's K-12 education system. We started in September 2018 with the rollout of KG1, KG2 and Primary 1. In 2021 we have rolled out Primary 4, and we will continue with the rollout until 2030. We are transforming the way in which students learn to prepare Egypt's youth to succeed in a future world that we cannot entirely imagine.

MOETE is very proud to present this new series of textbooks, with the accompanying digital learning materials that captures its vision of the transformation journey. This is the result of much consultation, much thought and a lot of work. We have drawn on the best expertise and experience from national and international organizations and education professionals to support us in translating our vision into an innovative national curriculum framework and exciting and inspiring print and digital learning materials.

The MOETE extends its deep appreciation to its own "Center for Curriculum and Instructional Materials Development" (CCIMD) and specifically, the CCIMD Director and her amazing team. MOETE is also very grateful to the minister's senior advisors and to our partners including "Discovery Education," "National Geographic Learning" "Nahdet Masr," "Longman Egypt," UNICEF, UNESCO, and WB, who, collectively, supported the development of Egypt's national curriculum framework. I also thank the Egyptian Faculty of Education professors who participated in reviewing the national curriculum framework. Finally, I thank each and every MOETE administrator in all MOETE sectors as well as the MOETE subject counselors who participated in the process.

This transformation of Egypt's education system would not have been possible without the significant support of Egypt's current president, His Excellency President Abdel Fattah el-Sisi. Overhauling the education system is part of the president's vision of 'rebuilding the Egyptian citizen' and it is closely coordinated with the ministries of Higher Education & Scientific Research, Culture, and Youth & Sports. Education 2.0 is only a part in a bigger national effort to propel Egypt to the ranks of developed countries and to ensure a great future to all of its citizens.

Words from the Minister of Education & Technical Education

It is my great pleasure to celebrate this extraordinary moment in the history of Egypt where we continue to launch a new education system designed to prepare a new Egyptian citizen proud of his Egyptian, Arab and African roots — a new citizen who is innovative, a critical thinker, able to understand and accept differences, competent in knowledge and life skills, able to learn for life and able to compete globally.

Egypt chose to invest in its new generations through building a transformative and modern education system consistent with international quality benchmarks. The new education system is designed to help our children and grandchildren enjoy a better future and to propel Egypt to the ranks of advanced countries in the near future.

The fulfillment of the Egyptian dream of transformation is indeed a joint responsibility among all of us; governmental institutions, parents, civil society, private sector and media. Here, I would like to acknowledge the critical role of our beloved teachers who are the role models for our children and who are the cornerstone of the intended transformation.

I ask everyone of us to join hands towards this noble goal of transforming Egypt through education in order to restore Egyptian excellence, leadership and great civilization.

My warmest regards to our children who will begin this journey and my deepest respect and gratitude to our great teachers.

Dr. Tarek Galal Shawki

Minister of Education & Technical Education

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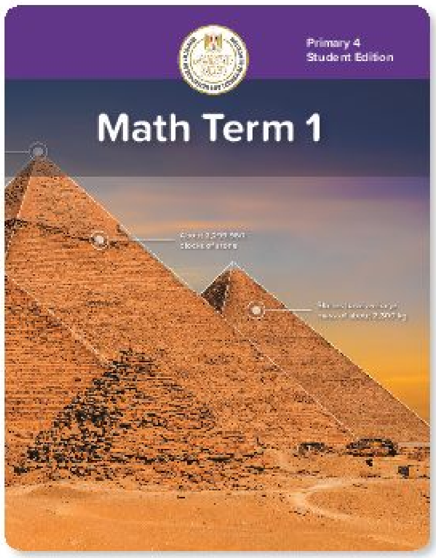
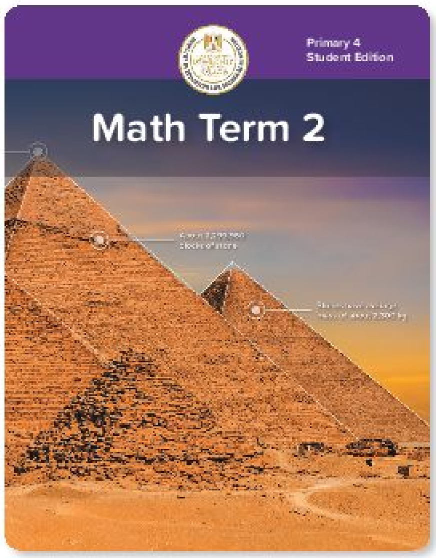
Program Overview

Welcome to Primary 4 Mathematics Techbook!

Mathematics is everywhere around us. Children begin investigating mathematical concepts at a very early age. In fact, researchers say babies can visually differentiate between different quantities, demonstrating budding numeracy as early as 6 months of age. Children get their first math education at home as they count, make one-to-one correspondence between ordinal numbers and objects, compare quantities, manipulate 2- and 3-dimensional shapes, solve puzzles, look at clocks and watches, play with money, and visit markets in their communities. Mathematics helps children make sense of the world around them. All children are capable of building deep conceptual understanding and procedural fluency in mathematics. This program seeks to support students' development as they learn to reason mathematically, communicate using appropriate mathematical language, solve complex problems, and work collaboratively with peers. As you read the new Primary 4 student and teacher instructional resources, keep a few things in mind:

- The Primary 1 through Primary 3 mathematics curriculum, implemented across Egypt starting from 2018 to 2020, helped lay a foundation for young students to solve complex mathematical problems, persevere in the face of challenging math content, and think and act like mathematicians.
- The Primary 4 mathematics content is more challenging than ever before. However students are aided by their experience in the new KG through Primary 3 curriculum. To help all students reach the challenging expectations in Prep and Secondary, Primary 4 Mathematics Techbook offers opportunities for student to build procedural fluency, make sense of real-world problems, model their thinking and problem-solving strategies, communicate their reasoning, make connections between prior learning and new concepts, and identify patterns and rules that promote number sense and make computation more efficient.
- The Primary 4 math curriculum is called a Techbook™. The Techbook is more than just print. It is a 21st-century instructional resource designed to inspire and empower all students through digital and print learning. You will find that the program has content in both print and digital locations so that students can learn no matter what access they have to the print book or digital versions.





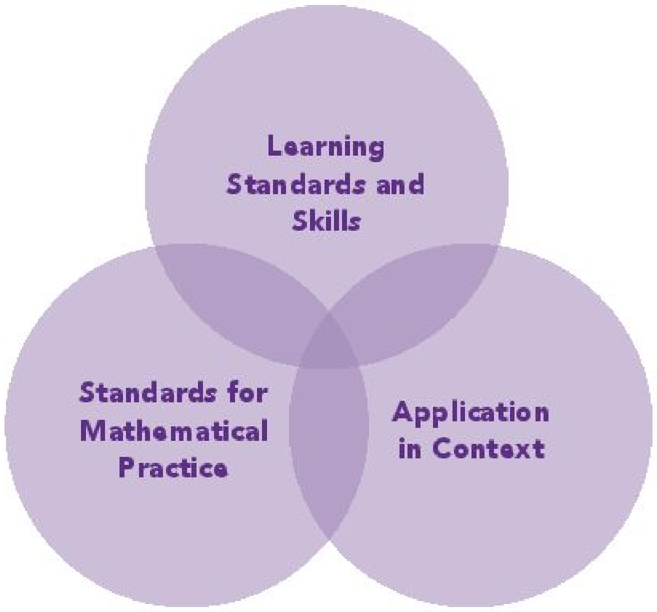
Program Philosophy

The Primary 4 Mathematics Techbook was designed and written to teach to the Ministry of Education Primary 4 Mathematics standards. These standards are internationally benchmarked, providing students in Egypt with a rigorous framework of learning targets.

The first step in building the Primary 4 standards was the adoption of new standards and specific grade-level indicators for learning and applications in number and operations, algebraic thinking, geometry, data collection and analysis, measurement, and fractions and decimals. These standards are integrated across three dimensions:

- Learning standards and skills
- Application in context
- Standards for mathematical practice

This entire approach to teaching mathematics is referred to as three-dimensional learning. The idea is that math is much more than an accumulation of facts; rather, it is an intersection of three dimensions: mathematical skills and concepts, problem solving, and engaging in practices that support mathematical thinking and reasoning.


Learning Standards and Skills
Standards for Mathematical Practice
Application in Context

The intersection of these three dimensions provides the foundation for the mathematics content in Primary 4. The structure of Primary 4 Mathematics Techbook also embodies the Ministry's shifts in the Framework for Education 2.0., specifically focusing on the following:

- accessing new and prior knowledge;
- building contextual understanding and procedural fluency; and
- making connections across mathematics domains to support application of skills and concepts.

Globally Prepared Students: Mathematics in Context

To help students make sense of mathematical content and to help students understand the role of mathematics in our lives, Primary 4 Mathematics Techbook integrates a thematic approach to help students understand and apply mathematics in a variety of real-world scenarios.

Engaging, Hands-On Learning: All Students as Mathematicians

Hands-On Activities (HOAs) are a central component of Primary 4 Mathematics Techbook. Hands-On Activities require students to investigate patterns and rules in mathematics; build mathematical understanding through observation, collaboration, and problem solving; communicate using mathematical language and models.

A materials list for each HOA is included in multiple locations: at point-of-use in digital and in the print Teacher Edition, both at front-of-concept and at point-of-use. Mathematics materials have been chosen to be easily accessible and mostly familiar to both students and teachers. Options are given for commercially available manipulatives and paper-based versions of those manipulatives. Each materials list should be reviewed well in advance of the date of classroom use to ensure all materials are available or prepared.

Photo Credit: ZouZou / Shutterstock.com

> “Thinking Like a Mathematician”

Reading, Writing, Speaking, and Listening in Mathematics

Reading, Writing, and Mathematics

Writing is an important part of mathematics because it is how real mathematicians document and communicate their ideas, activities, and conclusions to others. Primary 4 Mathematics Techbook engages students in many kinds of writing, particularly in Writing About Math tasks, which often ask students to explain their reasoning and support their thinking using words, numbers, pictures, and symbols.

Informational texts throughout Techbook help students strengthen their reading comprehension skills while providing context for learning. Primary 4 Mathematics Techbook also expects students to use speaking and listening skills to demonstrate their understanding and application of mathematics skills and concepts. Both the digital and the print resources will engage students in the practice of this type of writing, speaking, and listening.

Building Mathematical Language of All Students

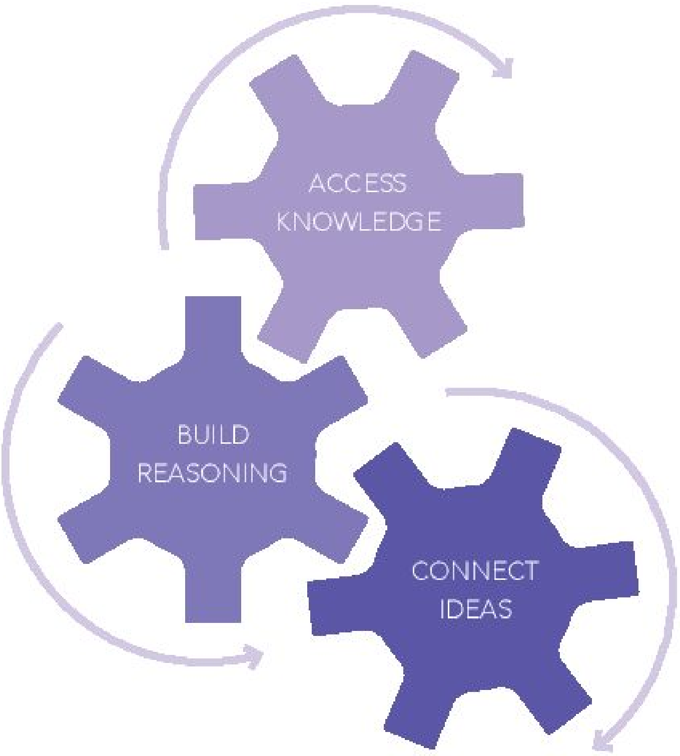
Reading and writing success in mathematics depends on the ability of students to understand not only the definition of vocabulary words, but also how the academic language connects ideas, adds details, or helps them accurately express their learning, thinking, and reasoning. Academic language is supported and emphasized through strategies for learning vocabulary, frequent vocabulary used in various contexts, and formative assessment items.

Student-Centered Learning and the A-B-C Instructional Framework

When one gear moves, they all move. All components of a lesson are dependent on one another and are not entirely linear. Students continue to access knowledge as they build understanding. They make connections as they access knowledge. They build understanding and reasoning as they connect ideas. When students engage in rich tasks that access prior knowledge and build reasoning, it is easier for them to efficiently and effectively make connections to the real world and to other mathematical learning.

A-B-C Instructional Framework

Lessons within the A-B-C Instructional framework are structured as follows:

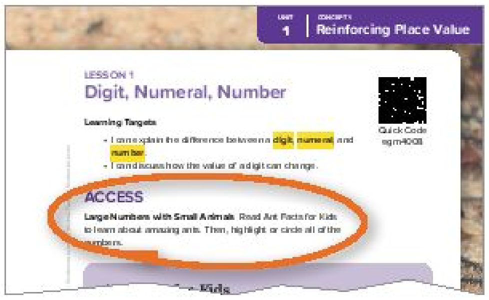


ACCESS (5-10 minutes)

Provides opportunities for:

- Engaging learners, leveraging prior knowledge, sparking interest
- Facilitating mathematical conversations to build connections
- Supporting various ways learners make their understandings visible

Focus: Developing and expressing mathematical language



UNIT 1 | CONCEPT 1 Reinforcing Place Value

LESSON 1

Digit, Numeral, Number

Quick Code

Learning Targets

- I can explain the difference between a digit, numeral, and number.
- I can discuss how the value of a digit can change.

ACCESS

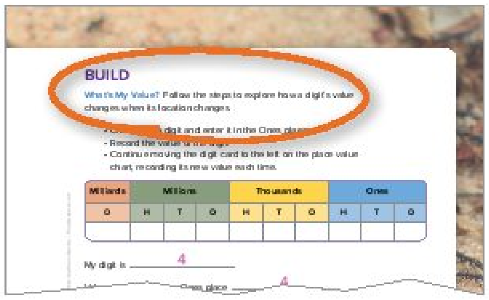
Large Numbers with Small Animals Read Ant Facts for Kids to learn about amazing ants. Then, highlight or circle all of the numbers.

BUILD (35-40 minutes)

Provides opportunities for:

- Developing fluencies with graduated levels of support
- Questioning, responding, and giving suggestions to support learning
- Reflecting on mistakes and misconceptions to improve understanding

Focus: Communicating about understanding, reasoning, evidence, strategies, and lingering questions



BUILD

What's My Value? Follow the steps to explore how a digit's value changes when its location changes.

- Continue moving the digit card to the left on the place value chart, recording its new value each time.

Milliards	Millions			Thousands			Ones		
O	H	T	O	H	T	O	H	T	O

My digit is 4

CONNECT (5-7 minutes)

Provides opportunities for:

- Connecting learner-generated strategies to procedures
- Engaging in challenging tasks that allow learners to transfer knowledge to new situations
- Identifying, expressing, and applying critical connections between and among mathematical skills and concepts

Focus: Building ability to communicate deep conceptual understanding and to ask meaningful questions to challenge misconceptions

UNIT 9

Comparing Fractions

CONNECT

Granola Bars

Healthy Snack Bars

WRAP-UP (3-5 minutes)

- Students express verbally or in writing what they "connected" and learned.

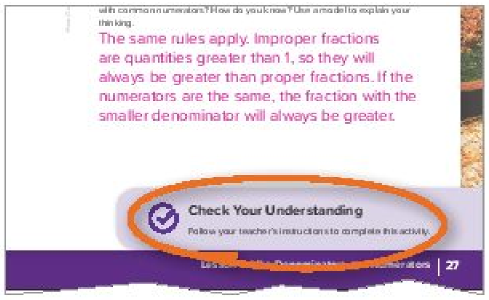
PRACTICE

- Helps teachers make decisions about instructional grouping and differentiation
- Up to 5 varied practice problems that allow students to demonstrate learning

Flexible use:

- Could be done with whole group, in small groups with or without the teacher, or independently (at the teacher's discretion)
- Could be part of remediation
- Could be an extension of the Wrap-Up discussion
- Lives in the digital Student Edition

Check Your Understanding



with common numerators? How do you know? Use a model to explain your thinking.

The same rules apply. Improper fractions are quantities greater than 1, so they will always be greater than proper fractions. If the numerators are the same, the fraction with the smaller denominator will always be greater.

Check Your Understanding

Follow your teacher's instructions to complete this activity.

27

- All lessons include a Check Your Understanding (CYU) section that consists of 2–5 practice problems. These problems allow teachers to collect information quickly and effectively about students' learning.
- The section can be assigned for independent practice during small group instruction (while the teacher works with other students) or homework.
- The section can include a little spiral review, but that should not be the focus of the CYU.
- These can be used for a grade.
- The Check Your Understanding problems are available in the digital Student Edition, and provided to the teacher for copying and distribution in the Teacher Edition. Answers to these problems appear within the Teacher Edition at point of use.

Assessment

Each Concept closes with a Concept Check-In and Remediation lesson. The Concept Check-In is a formative assessment that helps the teacher make instructional decisions. The Concept Check-In is accompanied by suggested strategies for addressing students' lingering misconceptions and errors. Concept Check-In and Remediation lessons are available in the digital Teacher Edition. A Unit Assessment is provided at the end of each unit of instruction. This assessment is summative and can be used for a grade.

Primary Mathematics 4

Course Structure

The Primary 4 Mathematics Techbook is a comprehensive teaching and learning package, featuring an easy-to-use digital platform, an interactive print Student Edition, and a print Teacher Edition. This print Teacher Edition provides guidance for teachers to implement high-quality, three-dimensional learning through Hands-On Activities, exploration of mathematics skills and concepts through models, practice, and application, and print and digital assets. This flexibility of resources supports the many variations of classroom settings, so teachers can implement standards-based lessons no matter their particular situation. The digital and print resources work seamlessly together, allowing students to both express thinking on paper and explore ideas and concepts digitally.

Place Value
Primary 4 Math
Theme 1: Number Sense and Operations
Unit Video Questions

Themes

The Primary 4 Mathematics Techbook is organized into four themes that form the structure of mathematics courses from Primary 4 through Primary 6. In each grade, the theme is studied through an applied topic, represented by units within this curricular resource. The themes and Primary 4 ***units*** are as follows:

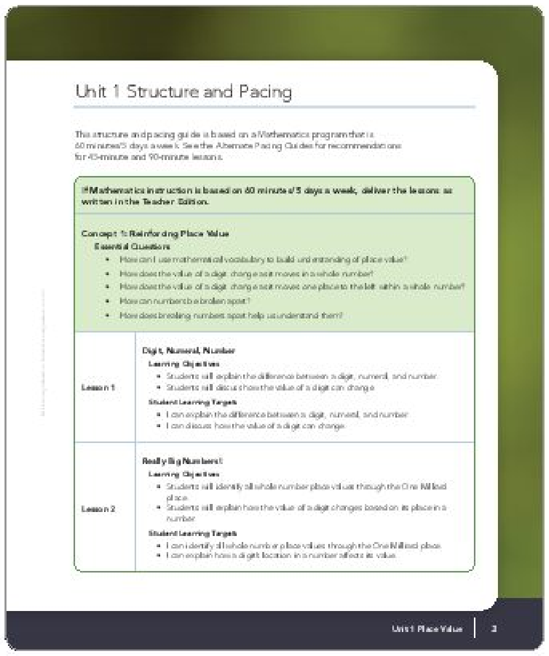
Theme	Primary 4 Units
Number Sense and Operations	1 – Place Value 2 – Addition and Subtraction Strategies 3 – Concepts of Measurement 4 – Area and Perimeter
Mathematical Operations and Algebraic Thinking	5 – Multiplication as a Relationship 6 – Understanding Factors and Multiples 7 – Multiplication and Division: Computation and Relationships 8 – Order of Operations
Fractions, Decimals,and Proportional Relationships	9 – Fractions 10 – Decimals 11 – Data with Fractions
Applications of Geometry and Measurement	12 – Geometry 13 – Angles of a Circle

Concepts

Units are divided into concepts. These concepts break down the major learning of each unit into chunks of instruction. This conceptual approach helps students make sense of new learning in the context of existing understandings and supports their efforts to make connections across skills and concepts.

Lessons

Each concept is composed of a series of lessons. The Unit Structure and Pacing information clearly outlines the sequence and duration of each lesson for schools with daily, 60-minute mathematics instructional periods. Alternative pacing is provided to support learning environments that teach math in 45-minute or 90-minute blocks of time.



Unit 1 Structure and Pacing

This structure and pacing guide is based on a Mathematics program that is 60 minutes/5 days a week. See the Alternate Pacing Guides for recommendations for 45-minute and 90-minute lessons.

If Mathematics instruction is based on 60 minutes/5 days a week, deliver the lessons as written in the Teacher Edition.	
Concept 1: Reinforcing Place Value **Essential Questions** • How can I use mathematical vocabulary to build understanding of place value? • How does the value of a digit change as it moves in a whole number? • How does the value of a digit change as it moves one place to the left within a whole number? • How can numbers be broken apart? • How does breaking numbers apart help us understand them?	
Lesson 1	**Digit, Numeral, Number** **Learning Objectives** • Students will explain the difference between a digit, numeral, and number. • Students will discuss how the value of a digit can change. **Student Learning Targets** • I can explain the difference between a digit, numeral, and number. • I can discuss how the value of a digit can change.
Lesson 2	**Really Big Numbers!** **Learning Objectives** • Students will identify all whole number place values through the One Millions place. • Students will explain how the value of a digit changes based on its place in a number. **Student Learning Targets** • I can identify all whole number place values through the One Millions place. • I can explain how a digit's location in a number affects its value.

Unit 1 Place Value | 3

Lessons typically begin with whole group discussion and instruction and may include partner or small-group, split-classroom, or station rotation learning activities.

- **Whole Group:** Provides an opportunity to bring students together as one whole group to introduce a new concept, engage in rich discussion-based or inquiry-based instruction, or address similar gaps in knowledge and provide instruction to address needs. Whole-class strategies can include Math Talk, Math Language Routines, discussion, teacher demonstrations, and giving directions.
- **Partner or Small Group:** Allows students to support one another's learning during whole group activities.
- **Split Classroom:** Allows teacher to focus on a topic or skill with up to half of the students in class, while the other half works independently or with a co-teacher.
- **Station Rotation:** Allows students to rotate through stations on a fixed schedule. One of the stations is typically teacher-led, while others can be independent or working with partner(s).

Review Lessons

Throughout the instructional materials, there are several lessons marked as Review lessons. These lessons are designed to help students recall and apply important skills and concepts they learned in Primary 3 before they move on to more challenging Primary 4 content. These lessons can be used with a small group or with the whole class, as needed. If students do not require a Review lesson before moving on to Primary 4 content, Review lessons can be skipped, and instruction can continue with the next lesson.

Tools and Text Features

The tools within every concept in Primary 4 Mathematics Techbook support differentiation for lessons and cater to the different learning preferences of diverse learners. In the digital core interactive text, students and teachers can have text read aloud, highlight important information, or annotate content with sticky notes. Select the text for any concept, and a reader tool will appear.

Teacher View

Digital Teacher Materials

In digital Primary 4 Mathematics Techbook, teachers can not only easily see the student view of content, but they can also access additional support using the Teacher Presentation Mode toggle. Teacher notes, including both the instructional focus and recommended strategy, are included with each activity and are visible to teachers only. In addition, teachers can view sample responses and detailed procedural notes.

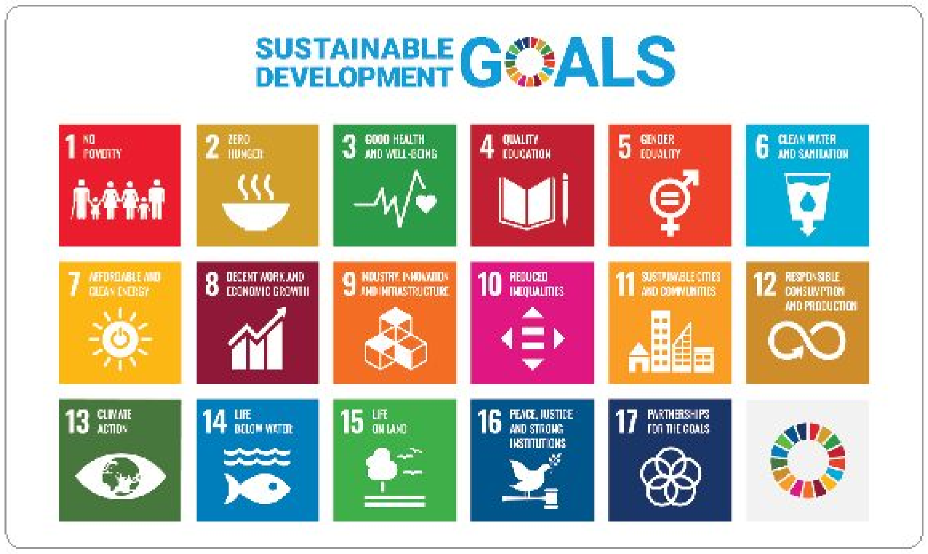
Flexible Learning Environment

With the evolution of technology, today's students expect information to be available differently than previous generations of students. Students are accessing information in shorter segments, streaming digital shows, and reading posts through social media. The Primary 4 Mathematics Techbook taps into students' preferences of consuming digital content and provides highly engaging, standards-based content guaranteed to inspire and encourage students to delve deeper into mathematics.

The Primary 4 Mathematics Techbook features rich multimedia resources: video, images, informational text, and more. Online mathematics tools allow all students to access and use tools that mathematicians use to analyze and solve problems, including calculators, geometry tools, construction tools, and whiteboards.

Interdisciplinary Projects: Content and Real-World Connections

A unique addition to the Primary 4 Mathematics Techbook is the Interdisciplinary Projects, provided for students once per term. These Interdisciplinary Projects are based on real-world challenges derived from the United Nations Sustainable Development Goals. Countries across the globe adopted these Sustainable Development Goals in 2015 (with annual monitoring and tracking) to "end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030.[1]"


SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS

For students to authentically connect to academic content, practice life skills, and deeply understand Egyptian Issues, we must provide opportunities for students to search for their own solutions. The Interdisciplinary Projects allow students to do just that. Students are presented with a challenge and then given the opportunity to generate ideas using knowledge and skills from science, mathematics, and other disciplines. Students work with classmates to design a solution to build, test, and refine using the Engineering Design Process.

The first Interdisciplinary Project, "To Get to the Other Side," challenges students to think about sustainability in a community that includes humans and other living organisms. Students consider the needs of a reptile, the blue Sinai agama, and how these lizards interact with a school community's needs for a new sidewalk.

Photo Credit: ZouZou / Shutterstock.com

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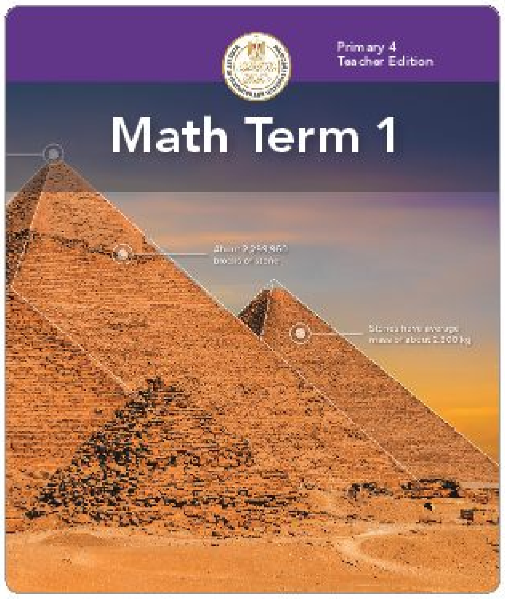
[1] https://www.undp.org/content/undp/en/home/sustainable-development-goals.html

Teacher Edition



The **Primary 4 Mathematics Teacher Edition** is designed to support instructors in the preparation and implementation of rich and engaging learning experiences. It provides clear step-by-step instructions embedded with teacher input, instructional strategies, and classroom management techniques. In these learning experiences, students explore, play, use manipulatives, communicate and collaborate with peers, ask and seek answers to questions, and practice new skills and concepts.

This instructional approach aims to help students accomplish the following goals:

- build numeracy
- discover connections between and among math concepts
- develop computational fluency
- acquire and use math vocabulary
- build awareness of measurement and geometry concepts
- enhance critical thinking, problem solving, collaboration, and communication
- increase enjoyment of math

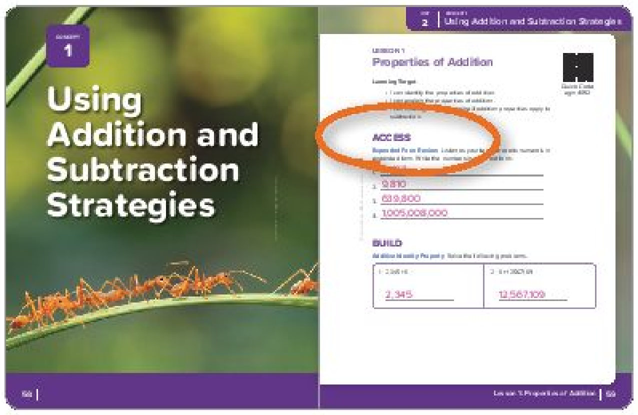
If instructors have not used such a guide before, some practical advice follows:

- read each unit carefully in advance of instruction. Make notes and highlight important details.
- ddvance preparation will ease the instructor's workload and ensure successful learning experiences for students.
- gather the necessary materials and make any preparations before implementing the lessons.
- consider additional classroom management techniques necessary for your particular class and learning environment.

Student Edition

The Primary 4 Mathematics Student Edition contains Learning Targets; ACCESS, BUILD and CONNECT sections; and Index, Student Resource, and Glossary pages.

ACCESS



1

Using Addition and Subtraction Strategies

2 Using Addition and Subtraction Strategies

Properties of Addition

ACCESS

2. 9,810

3. 639,800

4. 1,005,008,000

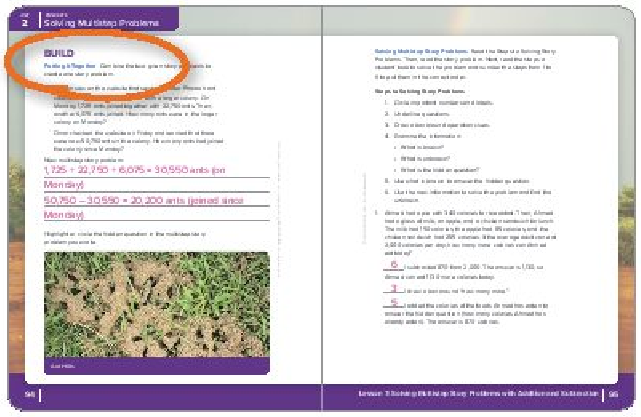
BUILD

2,345

12,567,109

- ACCESS provides a space for students to record their work and thinking as they participate in the ACCESS activity.
- Students work independently, in pairs, in small groups, or with the whole class to develop computational fluency and build deep conceptual understanding.
- Students work with the teacher and one another to build connections between prior knowledge and new learning.
- Students engage in error analysis to review and reinforce previously-learned skills and concepts.
- In error analysis, students review example work (work that was not completed by students in the class) and identify what was done correctly and incorrectly. Students are then given the opportunity to solve the problem on their own. Error analysis is important because it promotes higher-level thinking and aids in conceptual understanding. It also helps students feel comfortable with checking their own work and analyzing their own errors.

BUILD



2 Solving Multistep Problems

BUILD

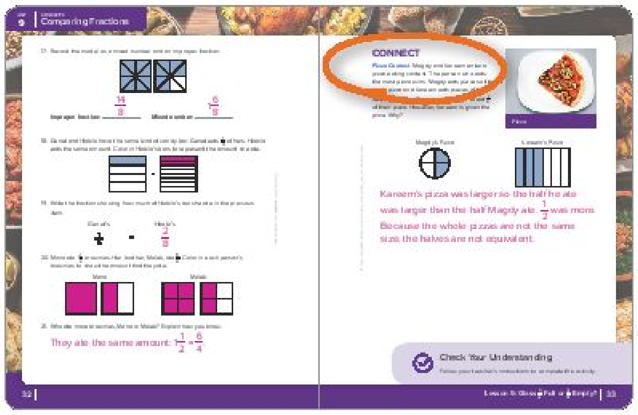
1,725 + 22,750 + 6,075 = 30,550 ants (on Monday)

50,750 – 30,550 = 20,200 ants (joined since Monday)

- BUILD provides an opportunity for students to immediately apply the skills and concepts they are learning in class.
- Students work independently, in pairs, and in small groups to explore, discover, and apply new skills and concepts.
- Students have multiple opportunities to check their work and the work of others. This kind of error analysis strengthens students' learning and deepens their understanding of mathematical concepts and connections.
- BUILD is an excellent resource for informally assessing student progress.

CONNECT

- Students reflect on their learning through drawing, writing, and completing related math activities.
- Writing About Math provides opportunities for students to make written connections between new content and previous learning and between formal math concepts and the real world.
- Writing About Math is another great resource for informally assessing student progress and gathering information about students' current understanding and potential misconceptions.



Comparing Fractions

They ate the same amount: $1\frac{1}{2} = \frac{6}{4}$

CONNECT

Kareem's pizza was larger so the half he ate was larger than the half Magdy ate. $\frac{1}{2}$ was more. Because the whole pizzas are not the same size, the halves are not equivalent.

Check Your Understanding

Resource Pages

These pages appear at the end of the Teacher Edition and include math tools and resources for students. Students may tear out these pages and cut, color, or use resources pages as directed by the teacher. Digital versions of these pages may be printed out and photocopied for student use.

The information you gather from the ACCESS, BUILD, AND CONNECT sections can be used to plan future instruction and differentiation (see Assessment).

Take note of the following:

- What are students discovering or learning? (Content)
- What are students' misconceptions or misunderstandings? (Remediation)
- What are students being asked to do? (Activity)
- What is the teacher discovering about students? (Assessment)
- How could you adapt the lesson for the different abilities in your class? (Differentiation)

During and after the implementation of each lesson, reflect and make notes on what was successful as well as possible suggestions for improvement.

Planning with another instructor can often lead to greater implementation success as it provides an opportunity to discuss classroom expectations, management procedures, and strategies for differentiation according to the needs of students. It is suggested that teachers meet with other instructors at least weekly to plan and reflect.

Formative Assessment

What is formative assessment?

The term *assessment* often brings to mind exams. Exams can be effective at summarizing learning at the end of a chapter, unit, instructional period, or school year. After a student learns material for a certain amount of time, an exam measures how much the student has learned, retained, and can apply. **Formative assessment** encompasses strategies used in the classroom to find out if and how much students are learning along the way, so that instruction can be adjusted.

Why embed formative assessment in instruction?

Formative assessment is a tool that supports responsive teaching. Embedding formative assessment provides instructors with evidence about how much students are learning, retaining, and applying. A teacher who frequently seeks and receives feedback about how much progress students are making toward learning goals can adjust instruction to respond to misconceptions, misunderstandings, and gaps in students' ability to apply learning.

How does embedding formative assessment improve learning?

The following table (William, 2011) provides an overview of five strategies that instructors, peers, and students can use to give and receive evidence of learning throughout the learning process.

	Where the Learning Is Going	Where the Learner Is Right Now	How to Get There
Teacher	Clarifying, sharing, and understanding what we intend for students to learn and the criteria for success	Eliciting evidence of learning	Providing feedback that moves learning forward
Peers		Activating learners as instructional resources for one another	
Learner		Activating learners as owners of their own learning	

Wiliam, Dylan. Embedded Formative Assessment. Bloomington: Solution Tree Press, 2011.

The first essential step is to identify (and share with students) the desired learning targets, or "where the learning is going." Once learning goals are established, teachers, peers, and students themselves can check in on "where the learner is right now," or how much progress is being made toward the goals. Rather than assessing whether or not a student has sufficiently learned content after the fact, formative assessment practices provide feedback so that teaching and learning ("how to get there") can be adjusted to better obtain the agreed-upon goals.

What does embedding formative assessment look like in the classroom?

Formative assessment often occurs through classroom discussions and tasks that ask students to explain and justify their thinking. If individual students struggle to understand or apply a concept, a teacher can differentiate instruction or provide peer support to meet that students' needs. Instructors can also gather information about student learning during instruction. For example, by walking around the classroom and checking students' work as they practice new learning in BUILD, teachers can learn a great deal very quickly about students' understanding and misconceptions. When many students exhibit evidence of misunderstanding or gaps in knowledge or skills, a teacher can decide to review, reteach, or present a new approach to achieving the learning goals.

Thinking Like a Mathematician

Students were introduced to the idea of thinking like a mathematician in Primary 3. As students begin to learn more complex and challenging mathematics, learning and practicing these skills and behaviors will help them become thoughtful, responsible learners. The instructor is advised to create a "Thinking Like a Mathematician" anchor chart (as shown below) to display throughout the year.

Good Mathematicians...	
Persevere	I can make sense of problems and keep trying.
Represent	I can show what the problem is asking in pictures, numbers, and words.
Explain	I can explain my thinking and work and compare my strategy with others.
Model	I can apply what I know about math in different problems.
Use Tools	I can choose appropriate tools and use them effectively to solve problems.
Are Accurate	I work carefully and check my work to make sure it is accurate and precise.
Use Structure	I can find patterns and use what I know to solve new problems.
Notice Patterns	I can use what I notice to explain rules and shortcuts when solving problems.

There are references to the "Thinking Like a Mathematician" skills and behaviors throughout the lessons. However, it is recommended that the instructor refer students to the anchor chart during instruction whenever possible and helpful, whether or not it is noted in the Teacher Edition.

Instructional Strategies

Many of the instructional strategies described below are woven throughout the Primary 4 Mathematics Teacher Edition. These are not meant to be the only methods used in the classroom; rather they are highlighted as best practices for engaging students in active, inquiry-based learning. As teachers and students gain familiarity with the strategies, instructors may wish to modify and personalize to suit the needs of each individual classroom.

Instructional Strategy Name	Brief Description
Ask 3 Before Me	Students ask three peers for assistance before asking the teacher. This strategy is used when students are working collaboratively to develop communication skills, encourage peer interactions, and decrease reliance on the teacher's support in large classrooms.
Attention-Getting Signal	The teacher uses an explicit signal to get the attention of the class when they are talking in pairs or working in groups. There are many options for signals, and more than one can be used as long as students recognize it. Options include a clap pattern that students repeat, a simple call and response phrase, or a hand in the air (see: Hands Up). This strategy allows teachers to ask for students' attention without shouting or immediately disrupting student conversations.
Brainstorm	Students provide multiple answers for an open-ended question. This can be done as a whole class or in groups or pairs. The purpose of a brainstorm is to list many answers, not to critique whether answers are realistic, feasible, or correct. Once an initial broad list is made, students can go back to answers to prioritize or eliminate some options. This strategy promotes creativity and problem-solving.
Calling Sticks	Teacher writes the names of students on popsicle sticks and places them in a can/jar. To call randomly on students, the teacher pulls a stick from the jar. After calling on the student, the teacher places that stick into another can/jar so that student is not immediately called on again. This strategy helps teachers call on a wide variety of students and encourages all students to be ready with an answer.
Count Off	Teacher breaks students into groups by having students count off to a certain number. It is important to tell students to remember their number. For example, if the teacher wants three groups, the first student counts one, the next student says two, the next say three, and the next student starts over at one, and so on. When all students have counted, tell all the number ones to meet together, all the number twos, and then all the number threes. This strategy enables time-efficient grouping and reinforces conceptual number use.
Fishbowl	Students gather around a teacher or group of students who are modeling something new. The students observe carefully as if they are watching fish in a bowl. This strategy promotes the full attention of students even when individual students are not actively participating in the demonstration.

Instructional Strategies and Differentiation

Instructional Strategy Name	Brief Description
Fist-to-Five	Student self-reflect using a "Fist-to-Five," where "fist" indicates no understanding and "five fingers" indicates a deep understanding of all terms.
Four Corners	Each of the four corners of the room corresponds to a possible opinion about a thought-provoking statement. The teacher may post a picture or a prompt in each corner of the room to represent the opinions/statements. Students walk to the corner that interests them or expresses their opinion to group with other like-minded students. This strategy allows students to express opinions and to prepare justifications with others who agree before presenting to the class.
Gallery Walk	As if in a museum, students walk past displays and respond to questions or prompts about the display. This strategy can be used in multiple ways, including to consider ideas posted on chart paper around the room or to view classmates' final products. This strategy encourages diversity of thought. When used at the end of a project, this strategy allows students to celebrate and take pride in their work while also honoring and responding to others' work.
Hands Up	The teacher holds a hand in the air to signal that students should stop what they are doing, stop talking, and look up at the teacher. When students notice the teacher's hand up, they also raise a hand to signal to classmates. This strategy is used as an attention-getting signal.
Hands Up, Pair Up	Students stand and walk around the room quietly with one hand raised in the air. The teacher says, "Stop—Pair Up." Students clap hands and stand together with a nearby student. Anyone with a hand still up needs as a partner. Students can easily find each other and pair up.
I Do, We Do, You Do	I Do: Teacher demonstrates or models an action to take place, such as reading a passage to the students. We Do: Students repeat the action with the teacher, such as re-reading a passage in unison. You Do: Student practices the learned action without the guidance of the teacher. This strategy supports students by modeling an expectation, allowing for low-pressure practice, then providing opportunities for independent practice.
Jigsaw	Students are divided into small "home" groups (for example, groups A, B, C, D, and E). The teacher provides different instruction (or instructional materials) to each "home" group so that each group becomes the "expert" in their unique skill or strategy. For example, there is a group of A experts, B experts, C experts, and so on. The teacher then carefully regroups students so that each new small group has at least one member of each "home" group. For example, each new group will now have one A, one B, one C, and so on. Student experts teach each other what they have learned. This strategy helps students develop ownership of their own learning, confirm their understanding, and build confidence in their mathematical abilities.

Instructional Strategy Name	Brief Description
Lean and Whisper	Students lean one shoulder in toward one neighbor to answer a question that has a one- or two-word (or short) answer. This strategy engages all students in answering a question without disrupting the flow of the classroom.
Model	The teacher or student demonstrates exactly how to complete a task. The rest of the class can ask questions before repeating what was demonstrated. This strategy allows the teacher to review any safety concerns or difficult aspects of a task, as well as share advice for task completion. This method should not be used for some inquiry activities, as it could over-influence the direction of student thinking.
One Stay One Stray	After working with partners, one person stays with the work product to present to other students while the second partner walks around and listens to peers in the class share. Then the two students switch roles. Using the strategy, both partners get to share their project and listen to others share.
Popcorn	Call on one student to answer a question. After the student has answered the question, they say, "Popcorn," and say the name of another student. It is now the turn of that student to answer the question, then pick a new student, and so on. If a student has responded, they should not be called upon a second time during the same Popcorn activity.
Relay Race	Divide the class into teams and have them line up single file. Call one student from each team to the front of the class. Ask students a question and the first to answer receives a point for their team. After answering, the student goes to the end of the line and the next student goes to the front of the room. A variation for math problems is for students to complete only one part of a math problem at a time.
Shake It Share It High Five	Students move around the classroom until the teacher signals to stop. Students then partner with a nearby student. Partners shake hands, share ideas or work products, then high five before moving around again to find a new partner. This strategy gets students out of their seats and moving, while also allowing them to share with classmates they do not sit near.
Shoulder Partners	Students lean and talk quietly with the person sitting next to them. Shoulder Partner can be used literally to just talk to the people sitting on either side, or it can be used for slightly larger groups of three or four with everyone's shoulders "touching." (This promotes the ability to speak softly—in sort of a huddle).
Think Aloud	The teacher models a process of thinking by speaking aloud what is thought. As an example, "I think I need more color here in my drawing." This strategy models for students the type of thinking they can use in an upcoming activity.
Snowball Fight	Students respond to a prompt using a half sheet of paper. The student crumples the paper up like a snowball and tosses it across the room. Students pick up a snowball that lands close to them, add their comment or answer, and crumple to toss again. Repeat as needed. The strategy encourages students to interact with the ideas of students who do not sit nearby in an anonymous manner.

Instructional Strategy Name	Brief Description
Think Time	Teacher allows a distinct period of silence so that students can process tasks, feelings, and responses. Allow students 15 to 30 seconds to think to themselves before calling on anyone to provide an answer to the class. This strategy is particularly helpful for shy or quiet students, as well as students who prefer to process content individually before contributing to a classroom or group conversation.
Thumbs Up	The teacher can quickly check for understanding using this strategy. Students hold thumbs up for agreement and thumbs down for disagreement to a question asked by the teacher. Thumbs up can also be used as a way for students to signal to a teacher that they are ready for an instruction. Thumbs Down should never be used to denote disagreement with a student's answer or idea.
Turn and Talk	Students turn "knee to knee" and "eye to eye" with a Shoulder Partner to discuss answers to long-form questions. This strategy allows students to discuss ideas, reflect on learning, and check each other's answers.
Venn Diagram	Teacher draws two or more large overlapping circles as a graphic organizer to show what is the same and different about multiple topics. Teacher notes similarities in the overlapping section of the circles, then summarizes differences in the respective parts of the circles that do not overlap. This strategy allows students to visually see and record similarities and differences.
Wait Time	Similar to the Think Time strategy, the teacher waits at least seven seconds after asking a question to the whole class or after calling on a student to respond. This provides time for students to think independently before an answer is given out loud.

Differentiated Instruction

Primary 4 Mathematics Techbook allows teachers to differentiate instruction, degrees of readiness, and interests. Techbook also offers resources to help vary content, process, product, and learning environment through the core instructional pathway.

Built upon the principles of Universal Design for Learning, Primary 4 Mathematics Techbook features a variety of content types, including images, video, text, and Hands-On Activities. These resources, included in both digital and print, provide multiple representations of the content and the flexibility for teachers to assign targeted content to whole groups or individual students.

Primary 4 Mathematics Scope and Sequence

An ● indicates initial introduction of content. Practice and application should continue beyond initial instruction.

Primary 4 • THEME	**1**	**2**	**3**	**4**
MATHEMATICS				
A. Numbers and Operations in Base Ten				
1. Apply and extend understanding of the place value system to multidigit whole numbers.				
a. Demonstrate understanding that in a multidigit whole number, a digit in one place represents ten times what it represents in the place to its right.	●			
b. Explain place value using numbers to 1,000,000,000, including the relative sizes of numbers in each place.	●			
c. Read and write numbers up to a milliard (billion) using numerals, word form, and expanded form.	●	●		
d. Use place value understanding to round multidigit whole numbers up to the milliards (billions) place.	●	●		
e. Order a set of numbers up to a milliard (billion).	●			
f. Compare two multidigit numbers using the symbols <, >, = to express the relationship.	●			
2. Use place value understanding and properties of operations to perform multidigit arithmetic.				
a. Fluently add and subtract multidigit whole numbers.	●	●		
b. Multiply a whole number of up to four digits by a one-digit whole number using strategies based on place value and the properties of operations.	●	●		
c. Multiply two two-digit numbers, with and without regrouping, using strategies based on place value and the properties of operations.	●	●		
d. Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division.	●	●		
e. Illustrate and explain calculations using equations or models.	●	●		

Scope and Sequence

Primary 4 • THEME	**1**	**2**	**3**	**4**
3. Use place value to read and write decimals to the Hundredths place.				
a. Read and write decimals to Hundredths using numerals, word form, and expanded form.			●	
b. Use models to illustrate and compare decimals to Hundredths.			●	
B. Numbers and Operations – Fractions and Decimals				
1. Extend understanding of fraction equivalence and ordering.				
a. Explain cases of fraction equivalency by using visual fraction models.			●	
b. Explain how the number and size of the parts of equivalent fractions differ even though the two fractions themselves are the same size.			●	
c. Identify and generate equivalent fractions.			●	
d. Compare two fractions using different strategies (for example, by comparing two fractions with different numerators and different denominators by creating common denominator or numerators or comparing to a benchmark fraction).			●	
e. Demonstrate understanding that fraction comparisons are valid only when the two fractions refer to the same whole.			●	
2. Build fractions from unit fractions.				
a. Demonstrate understanding of fraction $\frac{a}{b}$ with $a > 1$ as a sum of fractions $\frac{1}{b}$. 1) Explain addition and subtraction of fractions as joining and separating parts referring to the same whole. 2) Decompose a fraction into a sum of fractions with the same denominator in more than one way.			●	
b. Add up to three fractions with like denominators where one of the fractions is a unit fraction.			●	
c. Add and subtract fractions and whole numbers.			●	
d. Add and subtract mixed numbers with like denominators using equivalent fractions or properties of operations and the relationship between addition and subtraction.			●	
e. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators			●	

	1	2	3	4
f. Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. 1) Demonstrate understanding that fraction $\frac{a}{b}$ is a multiple of $\frac{1}{b}$. 2) Demonstrate understanding that a multiple of $\frac{a}{b}$ is a multiple of $\frac{1}{b}$, and use this understanding to multiply a fraction by a whole number. 3) Solve word problems involve multiplication of a fraction by a whole number using numerals, words, and models.			●	
3. Understand decimal notation for fractions, and compare decimal fractions.				
a. Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100 (for example express $\frac{2}{10}$ as $\frac{20}{100}$ and add $\frac{2}{10} + \frac{5}{100} = \frac{25}{100}$).			●	
b. Use decimal notation for fractions with denominators 10 or 100 (for example, write $\frac{62}{100}$ as .62).			●	
c. Compare two decimals to the Hundredths place.			●	
d. Demonstrate understanding that decimal comparisons are valid only when the two decimals refer to the same whole.			●	
e. Record the results of decimal comparisons using the symbols <, >, =.			●	
C. Operations and Algebraic Thinking				
1. Use the four operations with whole numbers to solve problems.				
a. Interpret a multiplication equation as a comparison (for example, 42 = 7 × 6 as a statement that 42 is 7 times as many as 6).	●	●		
b. Represent verbal statements of multiplicative comparisons as multiplication equations.	●	●		
c. Multiply or divide to solve word problems involving multiplicative comparison, (for example, using drawings and equations with a symbol for the unknown number to represent the problem).	●	●		
d. Solve multistep word problems posed with whole numbers using the four operations, including problems in which remainders must be interpreted. 1) Use letters in equations to represent unknown quantities.	●	●		

Primary 4 • THEME	1	2	3	4
e. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.	●	●		
f. Follow the standard order of operations to solve equations with multiple operations.	●	●		
2. Gain familiarity with factors and multiples.				
a. Demonstrate understanding that a whole number is a multiple of each of its factors. 1) Find all factor pairs for a whole number in the range 1–100.		●		
b. Find common multiples between two numbers.		●		
c. Find the greatest common factor between two whole numbers.		●		
d. Determine whether a given whole number in the range 1–100 is prime or composite.		●		
D. Measurement and Data				
1. Solve problems involving measurement and conversion of measurements.				
a. Demonstrate understanding of relative sizes of measurement units within one system of units including length (millimeters, centimeters, decimeters, meters, kilometers), mass (grams, kilograms, tons), capacity (milliliter and liter), and time (second, minute, hour, day).	●			
b. Use the four operations to solve word problems involving distances, intervals of time, liquid capacity, masses of objects, and money.	●			
c. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.	●			
d. Apply the area and perimeter formulas for rectangles in real world and mathematical problems.	●		●	
2. Ask and answer questions by collecting, organizing, and representing appropriate data.				
a. Select and make an appropriate graph to display a data set of measurements in fractions of a unit (for example, line plot, bar graph, or double bar graph).			●	
b. Solve problems involving addition and subtraction of fractions by using information presented in graphs (for example, from a line plot find and interpret the difference in height between the tallest and shortest students in the classroom).			●	

	1	2	3	4
E. Geometry				
1. Draw and identify lines and angles, and classify shapes by properties of their lines and angles.				
a. Identify points, lines, and angles in two-dimensional figures.				●
b. Demonstrate understanding that angles are geometric shapes that are formed wherever two rays share a common endpoint.				●
c. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines.				●
d. Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size.				●
e. Demonstrate understanding of right triangles as a category, and identify right triangles.				●
f. Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts.				●
g. Identify line-symmetric figures and draw lines of symmetry.				●
2. Geometric measurement: understand concepts of angle and measure angles.				
a. Demonstrate understanding that an angle is measured with reference to a circle with its center at the common endpoint of the rays by considering the fraction of the circular between the points where the two rays intersect the circle. 1) An angle that turns through $\frac{1}{360}$ of a circle is called a "one-degree angle". 2) An angle that turns through n one-degree angles is said to have an angle measure of n degrees.				●
b. Use non-standard tools to measure and draw angles (for example, paper models and analog clocks).				●
c. Use a protractor to measure angles of 30°, 45°, 60° and 90°.				●

UNIT

9

FRACTIONS

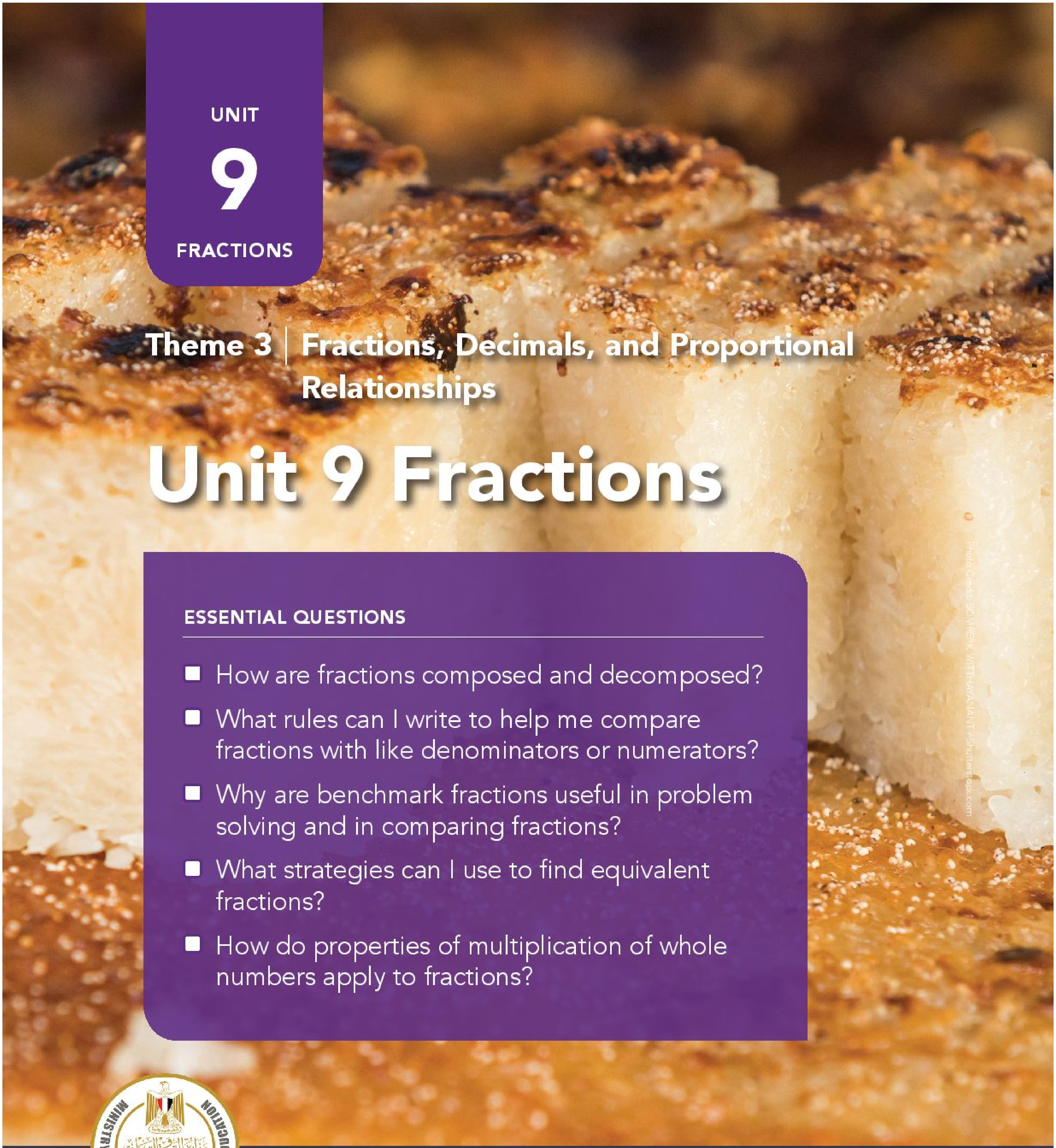


Photo Credit: SOMRERK WITTHAYANANT/Shutterstock.com

Theme 3 | Fractions, Decimals, and Proportional Relationships

Unit 9 Fractions

ESSENTIAL QUESTIONS

- How are fractions composed and decomposed?
- What rules can I write to help me compare fractions with like denominators or numerators?
- Why are benchmark fractions useful in problem solving and in comparing fractions?
- What strategies can I use to find equivalent fractions?
- How do properties of multiplication of whole numbers apply to fractions?

Video Questions

The Unit 9 Opener Video, Apple Fractions, uses apples to help students understand fraction concepts, including reading, writing, and comparing fractions. Students consider fractions of a whole and fractions of a set.

- How are fractions of a whole different from fractions of a set? How are they alike?
- As you eat meals throughout the day, think about how you could represent the quantities as fractions of a whole or fractions of a set.

Quick Code
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Key Vocabulary

As students investigate real-world situations, they will develop an understanding of and be introduced to the following key vocabulary:

benchmark, benchmark fraction, compare, compose, decompose, denominator, difference, equivalence, equivalency, equivalent, factor, fraction, improper fraction, like denominator, minuend, mixed number, multiple, non-unit fraction, numerator, order, product, proper fraction, relay race, simplest form, simplify, subtrahend, unit fraction, whole

Quick Code
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Photo Credit: SOMRERK WITTHAYANANT / Shutterstock.com

Fractions

Unit Storyline

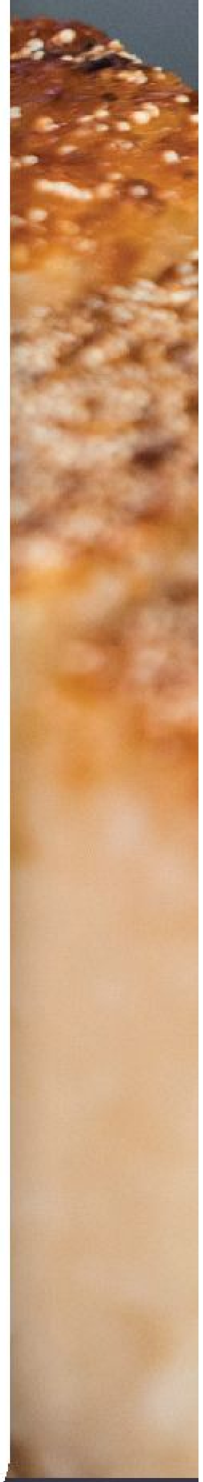
Unit 9 Fractions Storyline

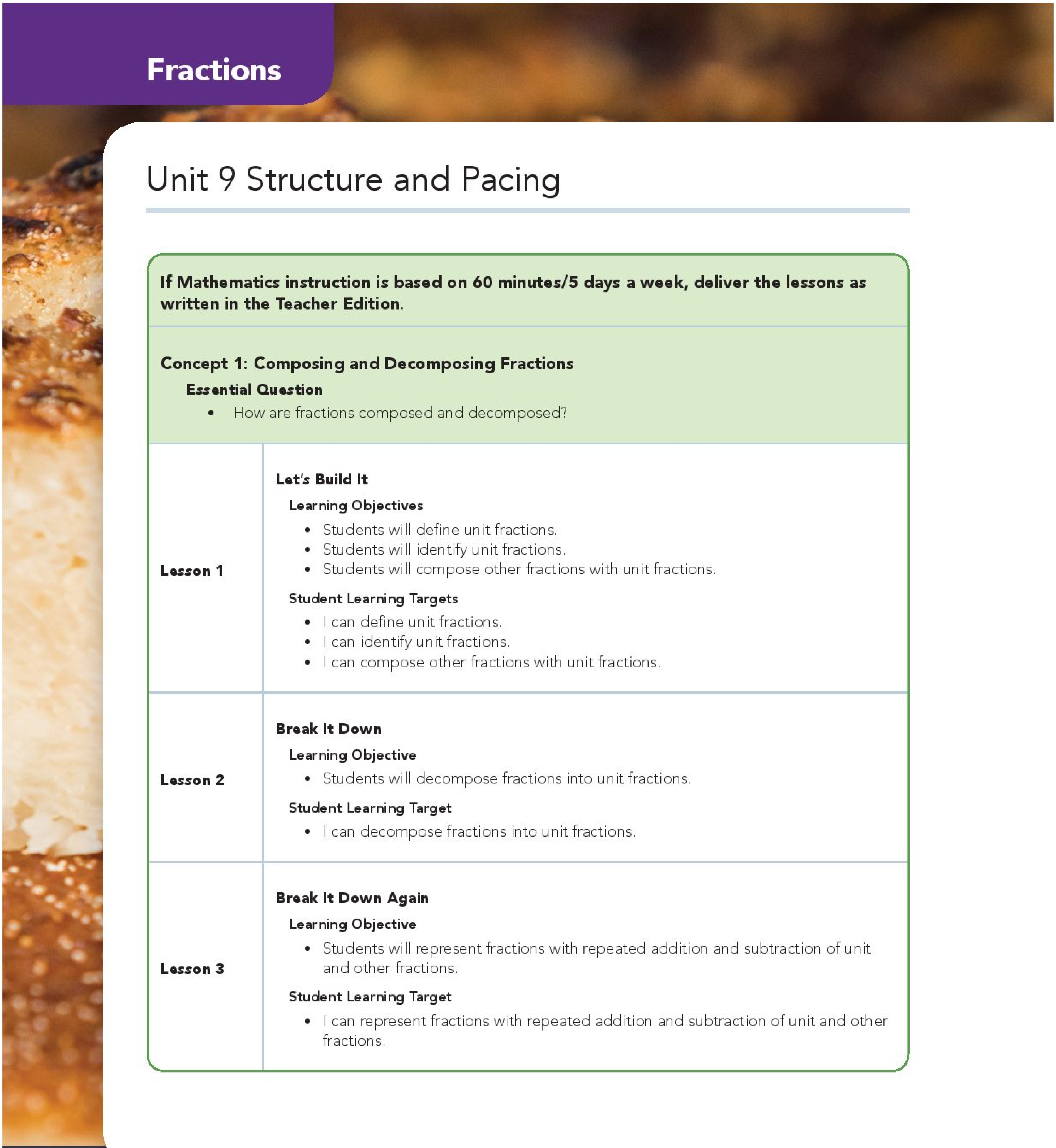
The Fractions unit extends students' working knowledge of the different components of a fraction, how to model fractional parts, and addition and subtraction of whole numbers. Students apply these understandings to develop the skill of adding and subtracting mixed numbers and simplifying improper fractions. To support their learning, students watch informative videos and explore recipes and other real-world applications of fractions.

Unit Standards

4.B.1	Extend understanding of fraction equivalence and ordering.
4.B.1.a	Explain cases of fraction equivalency by using visual fraction models.
4.B.1.b	Explain how the number and size of the parts of equivalent fractions differ even though the two fractions themselves are the same size.
4.B.1.c	Identify and generate equivalent fractions.
4.B.1.d	Compare two fractions using different strategies (for example, by comparing two fractions with different numerators and different denominators by creating like denominator or numerators or comparing to a benchmark fraction).
4.B.1.e	Demonstrate understanding that fraction comparisons are valid only when the two fractions refer to the same whole.
4.B.2	Build fractions from unit fractions.
4.B.2.a	Demonstrate understanding of fraction $\frac{a}{b}$ with $a > 1$ as a sum of fractions $\frac{1}{b}$. i. Explain addition and subtraction of fractions as joining and separating parts referring to the same whole. ii. Decompose a fraction into a sum of fractions with the same denominator in more than one way.

4.B.2.b	Add up to three fractions with like denominators where one of the fractions is a unit fraction.
4.B.2.c	Add and subtract fractions and whole numbers.
4.B.2.d	Add and subtract mixed numbers with like denominators using equivalent fractions or properties of operations and the relationship between addition and subtraction.
4.B.2.e	Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators.
4.B.2.f	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. i. Demonstrate understanding that fraction $\frac{a}{b}$ is a multiple of $\frac{1}{b}$. ii. Demonstrate understanding that a multiple of $\frac{a}{b}$ is a multiple of $\frac{1}{b}$, and use this understanding to multiply a fraction by a whole number. iii. Solve word problems involve multiplication of a fraction by a whole number using numerals, words, and models.





Unit 9 Structure and Pacing

If Mathematics instruction is based on 60 minutes/5 days a week, deliver the lessons as written in the Teacher Edition.

Concept 1: Composing and Decomposing Fractions

Essential Question

- How are fractions composed and decomposed?

Lesson 1	**Let's Build It** **Learning Objectives** • Students will define unit fractions. • Students will identify unit fractions. • Students will compose other fractions with unit fractions. **Student Learning Targets** • I can define unit fractions. • I can identify unit fractions. • I can compose other fractions with unit fractions.
Lesson 2	**Break It Down** **Learning Objective** • Students will decompose fractions into unit fractions. **Student Learning Target** • I can decompose fractions into unit fractions.
Lesson 3	**Break It Down Again** **Learning Objective** • Students will represent fractions with repeated addition and subtraction of unit and other fractions. **Student Learning Target** • I can represent fractions with repeated addition and subtraction of unit and other fractions.

Lesson 4	**All Mixed Up** **Learning Objectives** • Students will define mixed numbers. • Students will define improper fractions. • Students will explain how mixed numbers and improper fractions relate to unit fractions. **Student Learning Targets** • I can define mixed numbers. • I can define improper fractions. • I can explain how mixed numbers and improper fractions relate to unit fractions.
Lesson 5	**Pieces from the Whole** **Learning Objective** • Students will add and subtract fractions and whole numbers. **Student Learning Target** • I can add and subtract fractions and whole numbers.
Lesson 6	**Adding Mixed Numbers** **Learning Objective** • Students will add mixed numbers with like denominators. **Student Learning Target** • I can add mixed numbers with like denominators.
Lesson 7	**Subtracting Mixed Numbers** **Learning Objective** • Students will subtract mixed numbers with like denominators. **Student Learning Target** • I can subtract mixed numbers with like denominators.

Unit Structure and Pacing *cont'd*

Concept Check-In and Remediation

Learning Objective

- Students will work to correct misconceptions and errors related to composing and decomposing proper fractions, improper fractions, and mixed numbers.

Student Learning Target

- I can correct my misconceptions and errors related to composing and decomposing proper fractions, improper fractions, and mixed numbers.

Concept 2: Comparing Fractions

Essential Questions

- What patterns can I observe when comparing fractions with like denominators or numerators?
- What strategies can I use to find equivalent fractions?
- Why are benchmark fractions useful in problem solving and in comparing fractions?

Lesson 8

Like Denominators and Numerators

Learning Objectives

- Students will compare and order fractions with like denominators.
- Students will compare and order fractions with like numerators.

Student Learning Targets

- I can compare and order fractions with like denominators.
- I can compare and order fractions with like numerators.

Lesson 9

Glass $\frac{1}{2}$ Full or $\frac{2}{4}$ Empty?

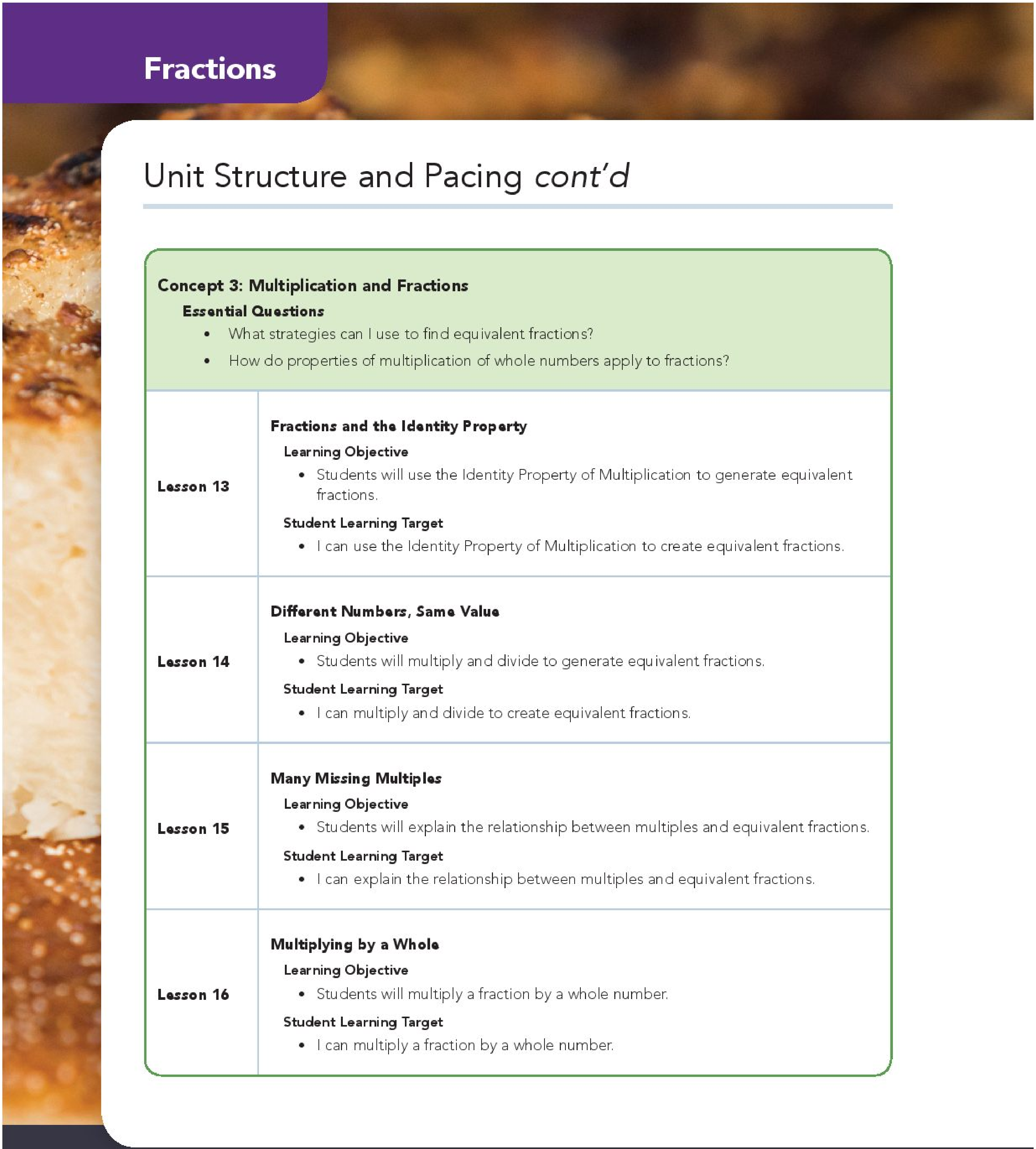
Learning Objective

- Students will use visual models to identify equivalent fractions.

Student Learning Target

- I can use visual models to identify equivalent fractions.

Lesson 10	**Same Fraction, Different Day** **Learning Objectives** • Students will use visual models and multiples to generate equivalent fractions. • Students will explain what makes two fractions equivalent. **Student Learning Targets** • I can use visual models and multiples to generate equivalent fractions. • I can explain what makes two fractions equivalent.
Lesson 11	**Benchmark Fractions** **Learning Objectives** • Students will identify benchmark fractions. • Students will generate fractions equivalent to benchmark fractions. **Student Learning Targets** • I can identify benchmark fractions. • I can generate fractions equivalent to benchmark fractions.
Lesson 12	**Half or Whole?** **Learning Objective** • Students will compare fractions to a benchmark fraction. **Student Learning Target** • I can compare fractions to a benchmark fraction.
	Concept Check-In and Remediation **Learning Objective** • Students will work to correct misconceptions and errors related to comparing fractions. **Student Learning Target** • I can correct my misconceptions and errors related to comparing fractions.



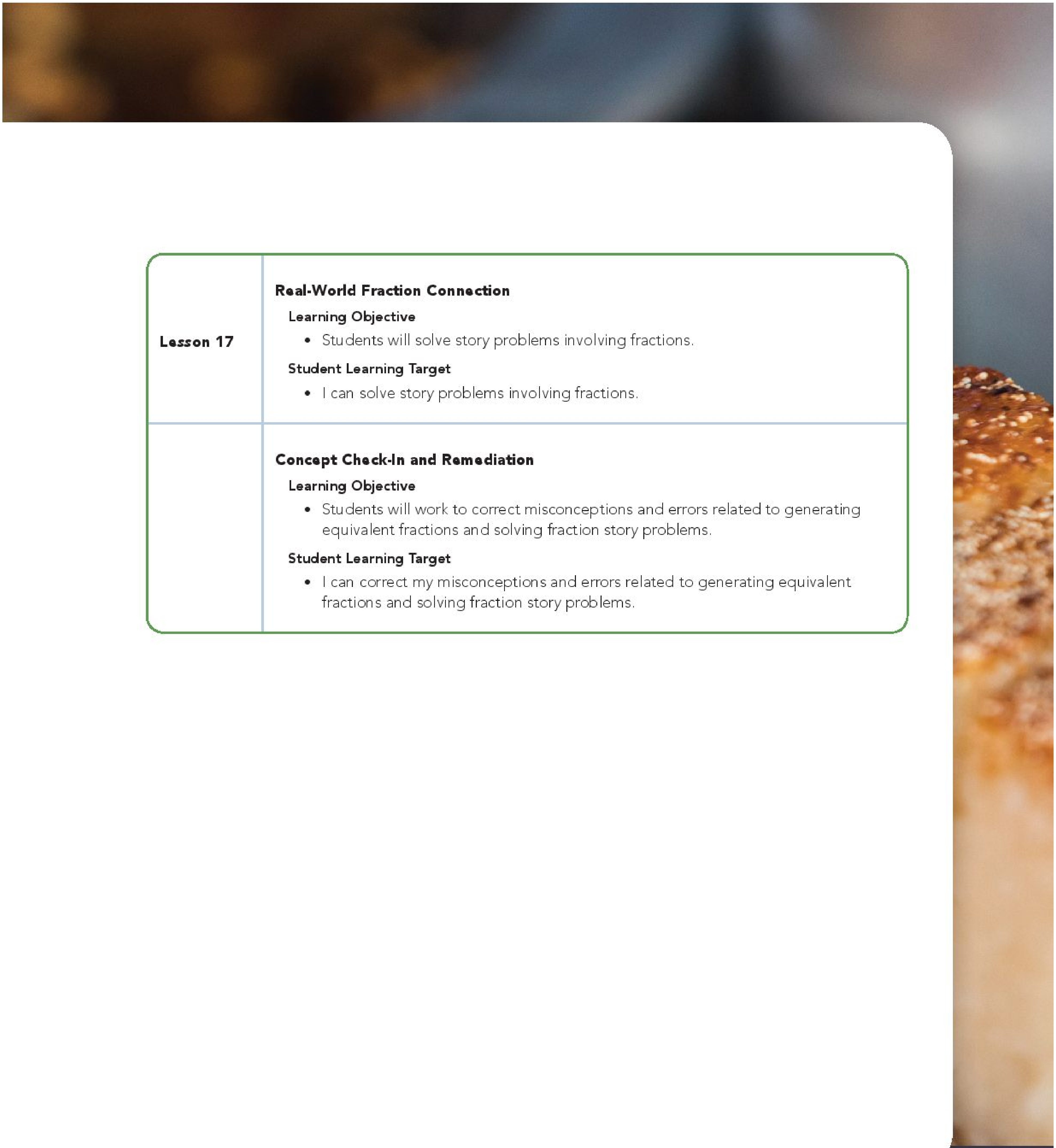
Unit Structure and Pacing *cont'd*

Concept 3: Multiplication and Fractions

Essential Questions

- What strategies can I use to find equivalent fractions?
- How do properties of multiplication of whole numbers apply to fractions?

Lesson 13	**Fractions and the Identity Property** **Learning Objective** • Students will use the Identity Property of Multiplication to generate equivalent fractions. **Student Learning Target** • I can use the Identity Property of Multiplication to create equivalent fractions.
Lesson 14	**Different Numbers, Same Value** **Learning Objective** • Students will multiply and divide to generate equivalent fractions. **Student Learning Target** • I can multiply and divide to create equivalent fractions.
Lesson 15	**Many Missing Multiples** **Learning Objective** • Students will explain the relationship between multiples and equivalent fractions. **Student Learning Target** • I can explain the relationship between multiples and equivalent fractions.
Lesson 16	**Multiplying by a Whole** **Learning Objective** • Students will multiply a fraction by a whole number. **Student Learning Target** • I can multiply a fraction by a whole number.



Lesson 17	**Real-World Fraction Connection** **Learning Objective** • Students will solve story problems involving fractions. **Student Learning Target** • I can solve story problems involving fractions.
	Concept Check-In and Remediation **Learning Objective** • Students will work to correct misconceptions and errors related to generating equivalent fractions and solving fraction story problems. **Student Learning Target** • I can correct my misconceptions and errors related to generating equivalent fractions and solving fraction story problems.

Alternate Pacing Guides

If Mathematics instruction is based on 45 minutes/5 days a week, do the following:

Reduce ACCESS by 3 minutes

Reduce BUILD by 8 minutes

Reduce CONNECT by 2 minutes

Reduce WRAP-UP by 2 minutes

Strategies for reducing time in each section:

- Discuss fewer examples
- Eliminate Shoulder Partner conversations
- Shorten class discussions
- Work with students to complete ACCESS problems

If Mathematics instruction is based on 45 minutes/4 days a week and 90 minutes/1 day a week, do the following:

Follow the 45-minute approach for the 45-minute days.

Teach two 45-minute lessons on the 90-minute day.

If Mathematics instruction is based on 90 minutes/5 days a week, do the following:

Increase ACCESS by 5 minutes

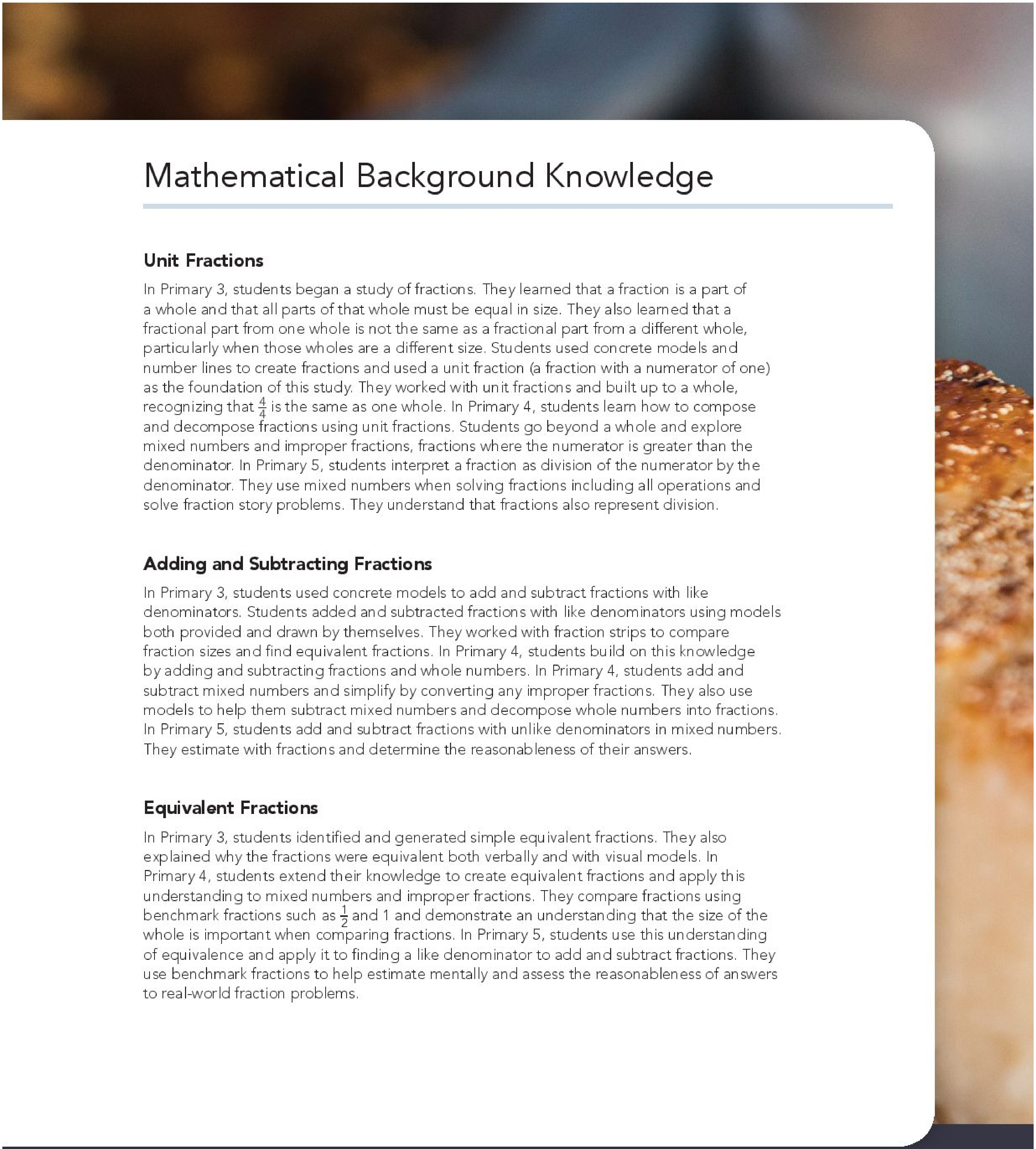
Increase BUILD by 20 minutes

Increase CONNECT by 3 minutes

Increase WRAP-UP by 2 minutes

Strategies for increasing time in each section:

- Discuss additional examples as needed
- Extend class discussions
- Allow time for hands-on work with manipulatives and models
- Provide additional practice problems for students who need additional practice
- Encourage students to share and model their problem-solving strategies



Mathematical Background Knowledge

Unit Fractions

In Primary 3, students began a study of fractions. They learned that a fraction is a part of a whole and that all parts of that whole must be equal in size. They also learned that a fractional part from one whole is not the same as a fractional part from a different whole, particularly when those wholes are a different size. Students used concrete models and number lines to create fractions and used a unit fraction (a fraction with a numerator of one) as the foundation of this study. They worked with unit fractions and built up to a whole, recognizing that $\frac{4}{4}$ is the same as one whole. In Primary 4, students learn how to compose and decompose fractions using unit fractions. Students go beyond a whole and explore mixed numbers and improper fractions, fractions where the numerator is greater than the denominator. In Primary 5, students interpret a fraction as division of the numerator by the denominator. They use mixed numbers when solving fractions including all operations and solve fraction story problems. They understand that fractions also represent division.

Adding and Subtracting Fractions

In Primary 3, students used concrete models to add and subtract fractions with like denominators. Students added and subtracted fractions with like denominators using models both provided and drawn by themselves. They worked with fraction strips to compare fraction sizes and find equivalent fractions. In Primary 4, students build on this knowledge by adding and subtracting fractions and whole numbers. In Primary 4, students add and subtract mixed numbers and simplify by converting any improper fractions. They also use models to help them subtract mixed numbers and decompose whole numbers into fractions. In Primary 5, students add and subtract fractions with unlike denominators in mixed numbers. They estimate with fractions and determine the reasonableness of their answers.

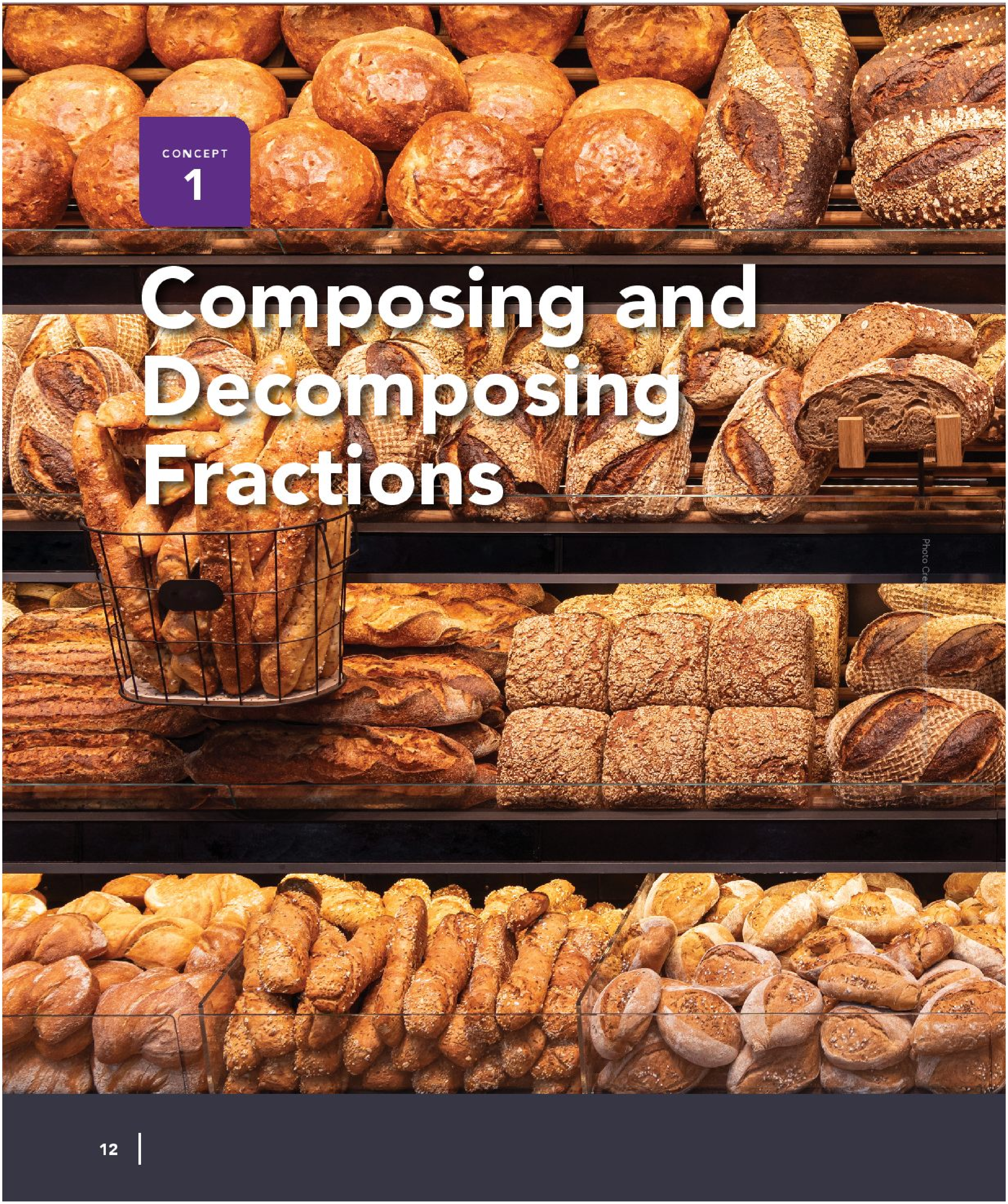
Equivalent Fractions

In Primary 3, students identified and generated simple equivalent fractions. They also explained why the fractions were equivalent both verbally and with visual models. In Primary 4, students extend their knowledge to create equivalent fractions and apply this understanding to mixed numbers and improper fractions. They compare fractions using benchmark fractions such as $\frac{1}{2}$ and 1 and demonstrate an understanding that the size of the whole is important when comparing fractions. In Primary 5, students use this understanding of equivalence and apply it to finding a like denominator to add and subtract fractions. They use benchmark fractions to help estimate mentally and assess the reasonableness of answers to real-world fraction problems.

CONCEPT

1

Composing and Decomposing Fractions



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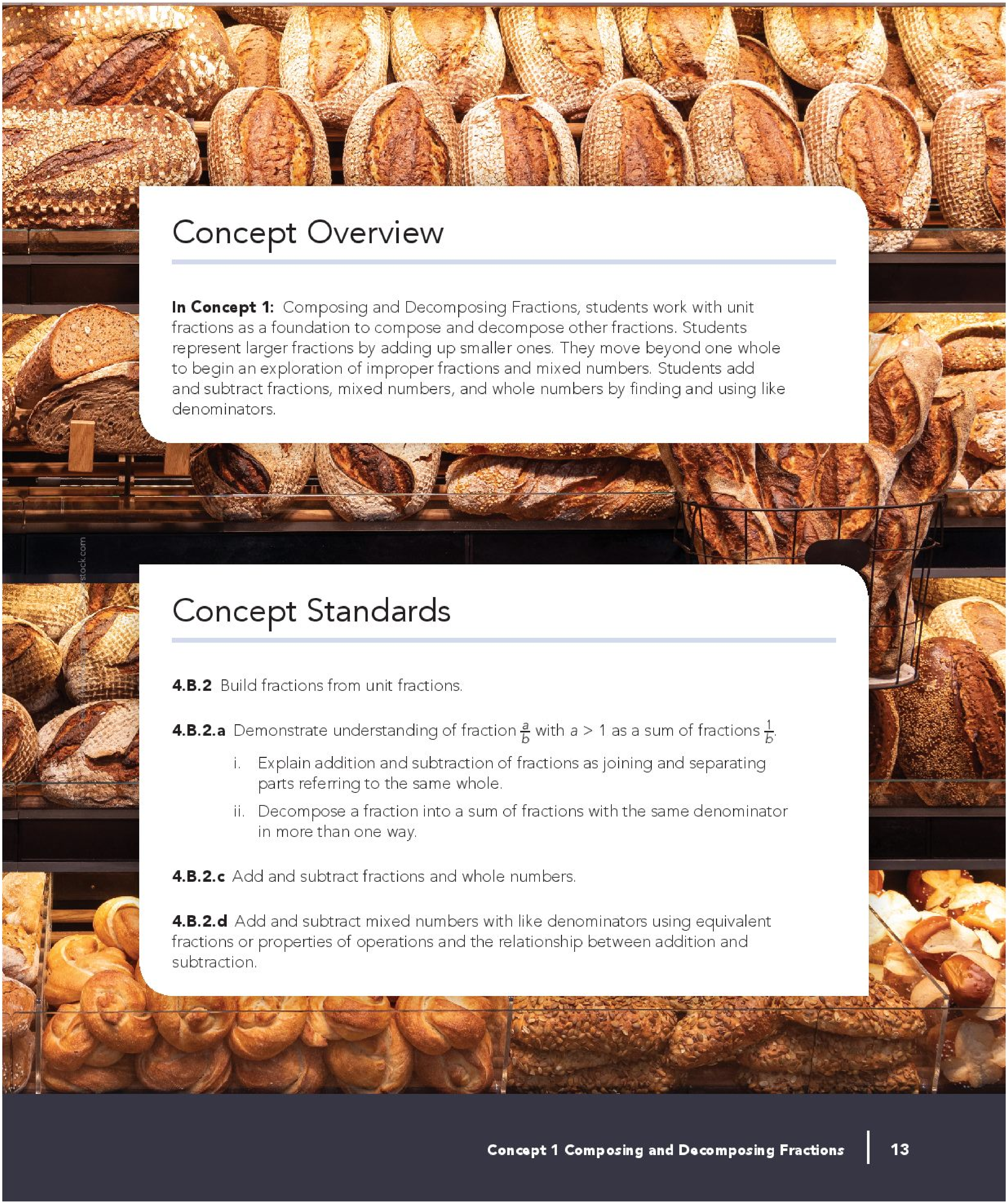

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Concept Overview

In Concept 1: Composing and Decomposing Fractions, students work with unit fractions as a foundation to compose and decompose other fractions. Students represent larger fractions by adding up smaller ones. They move beyond one whole to begin an exploration of improper fractions and mixed numbers. Students add and subtract fractions, mixed numbers, and whole numbers by finding and using like denominators.

Concept Standards

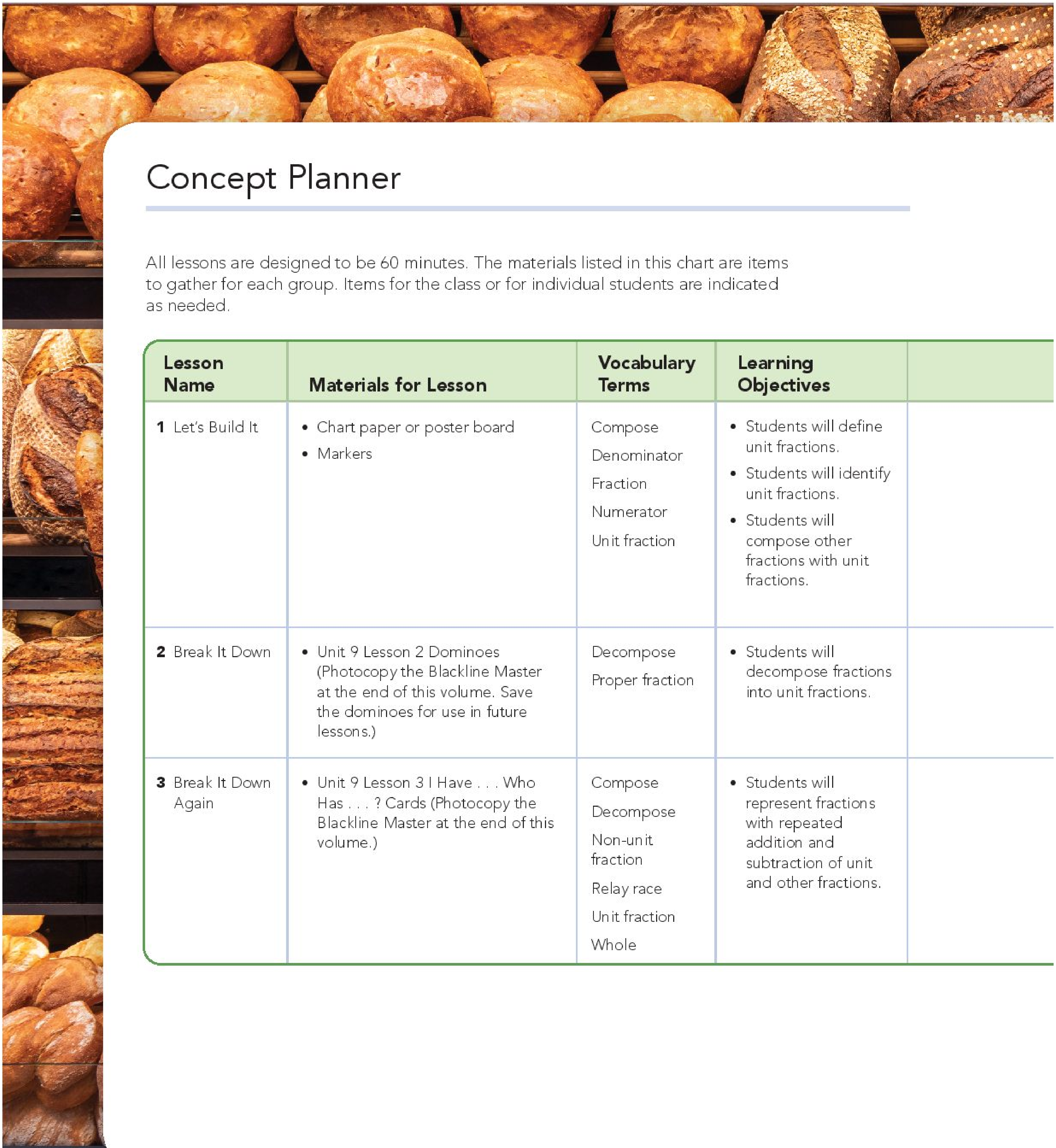
4.B.2 Build fractions from unit fractions.

4.B.2.a Demonstrate understanding of fraction $\frac{a}{b}$ with $a > 1$ as a sum of fractions $\frac{1}{b}$.

- i. Explain addition and subtraction of fractions as joining and separating parts referring to the same whole.
- ii. Decompose a fraction into a sum of fractions with the same denominator in more than one way.

4.B.2.c Add and subtract fractions and whole numbers.

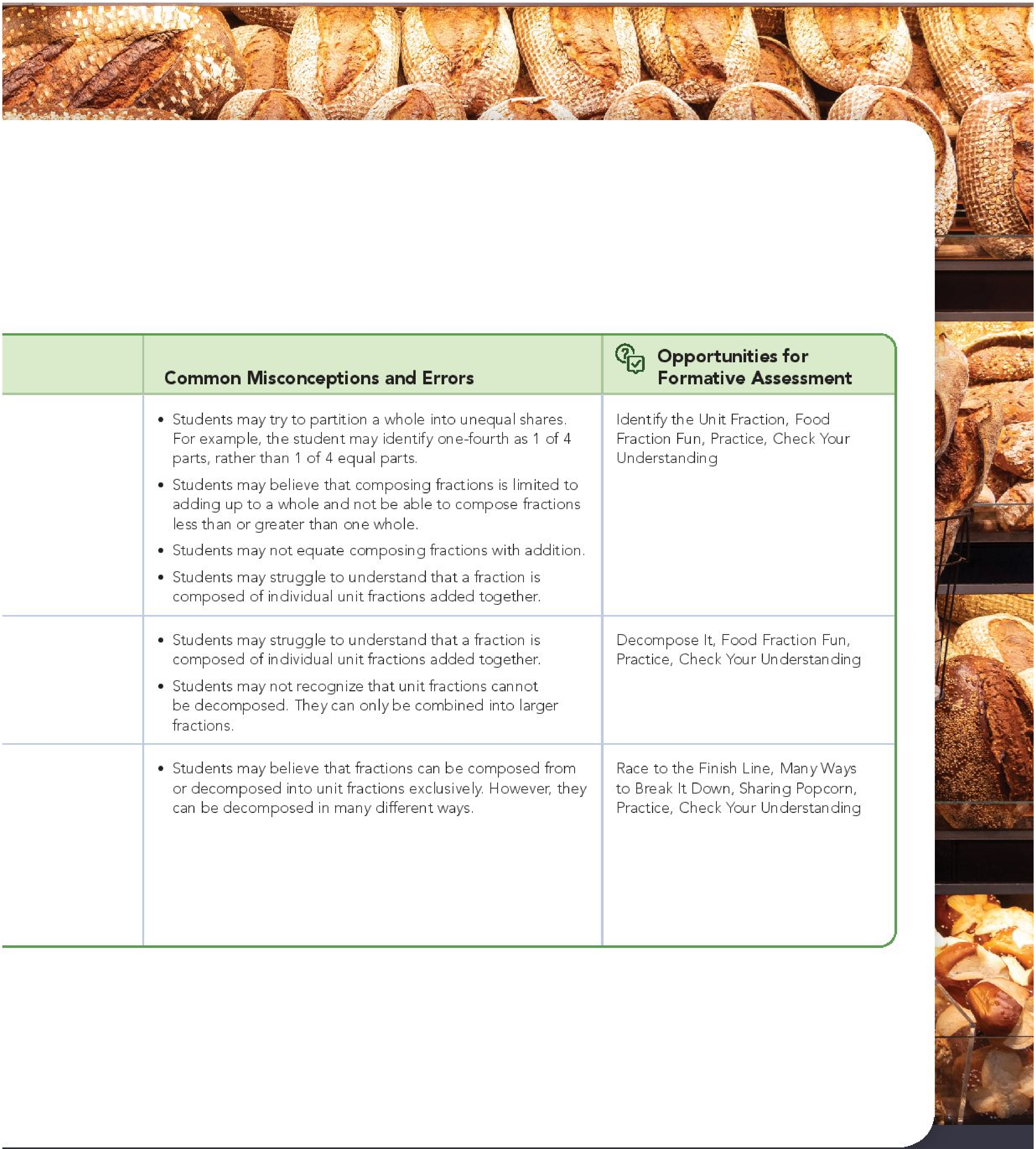
4.B.2.d Add and subtract mixed numbers with like denominators using equivalent fractions or properties of operations and the relationship between addition and subtraction.



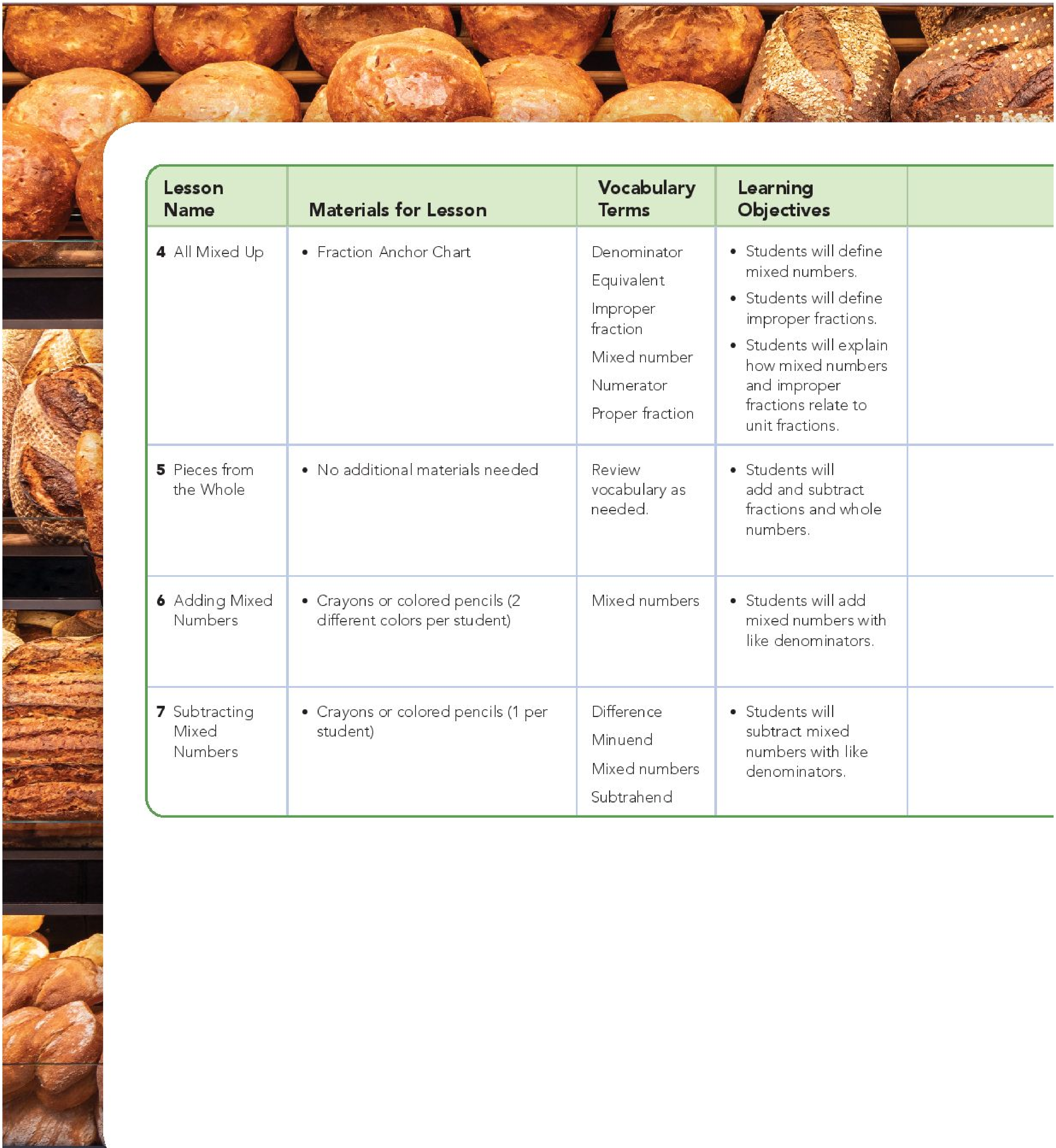
Concept Planner

All lessons are designed to be 60 minutes. The materials listed in this chart are items to gather for each group. Items for the class or for individual students are indicated as needed.

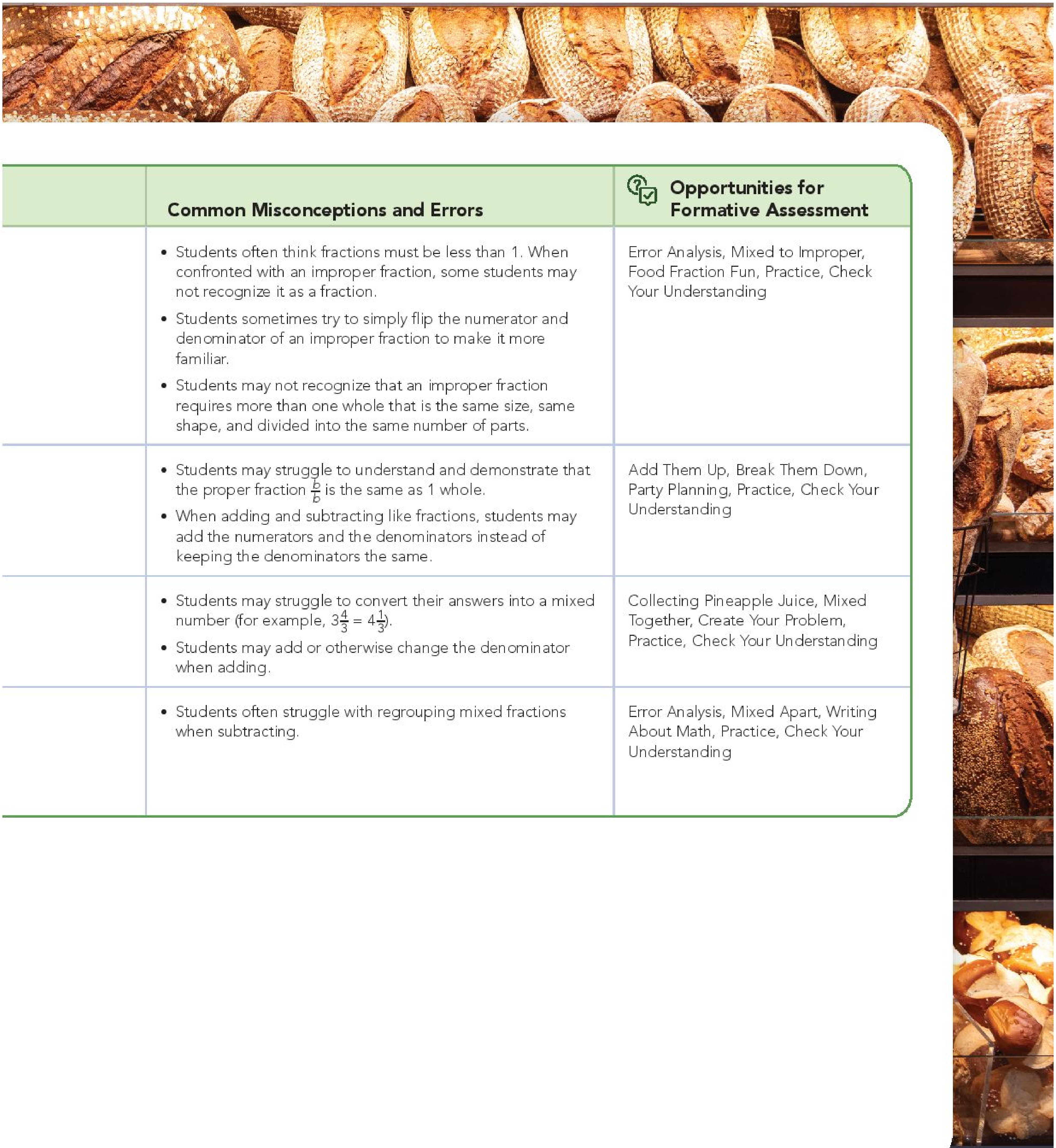
Lesson Name	Materials for Lesson	Vocabulary Terms	Learning Objectives	
1 Let's Build It	• Chart paper or poster board • Markers	Compose Denominator Fraction Numerator Unit fraction	• Students will define unit fractions. • Students will identify unit fractions. • Students will compose other fractions with unit fractions.	
2 Break It Down	• Unit 9 Lesson 2 Dominoes (Photocopy the Blackline Master at the end of this volume. Save the dominoes for use in future lessons.)	Decompose Proper fraction	• Students will decompose fractions into unit fractions.	
3 Break It Down Again	• Unit 9 Lesson 3 I Have . . . Who Has . . . ? Cards (Photocopy the Blackline Master at the end of this volume.)	Compose Decompose Non-unit fraction Relay race Unit fraction Whole	• Students will represent fractions with repeated addition and subtraction of unit and other fractions.	



	Common Misconceptions and Errors	Opportunities for Formative Assessment
	• Students may try to partition a whole into unequal shares. For example, the student may identify one-fourth as 1 of 4 parts, rather than 1 of 4 equal parts. • Students may believe that composing fractions is limited to adding up to a whole and not be able to compose fractions less than or greater than one whole. • Students may not equate composing fractions with addition. • Students may struggle to understand that a fraction is composed of individual unit fractions added together.	Identify the Unit Fraction, Food Fraction Fun, Practice, Check Your Understanding
	• Students may struggle to understand that a fraction is composed of individual unit fractions added together. • Students may not recognize that unit fractions cannot be decomposed. They can only be combined into larger fractions.	Decompose It, Food Fraction Fun, Practice, Check Your Understanding
	• Students may believe that fractions can be composed from or decomposed into unit fractions exclusively. However, they can be decomposed in many different ways.	Race to the Finish Line, Many Ways to Break It Down, Sharing Popcorn, Practice, Check Your Understanding



Lesson Name	Materials for Lesson	Vocabulary Terms	Learning Objectives	
4 All Mixed Up	- Fraction Anchor Chart	Denominator Equivalent Improper fraction Mixed number Numerator Proper fraction	- Students will define mixed numbers. - Students will define improper fractions. - Students will explain how mixed numbers and improper fractions relate to unit fractions.	
5 Pieces from the Whole	- No additional materials needed	Review vocabulary as needed.	- Students will add and subtract fractions and whole numbers.	
6 Adding Mixed Numbers	- Crayons or colored pencils (2 different colors per student)	Mixed numbers	- Students will add mixed numbers with like denominators.	
7 Subtracting Mixed Numbers	- Crayons or colored pencils (1 per student)	Difference Minuend Mixed numbers Subtrahend	- Students will subtract mixed numbers with like denominators.	

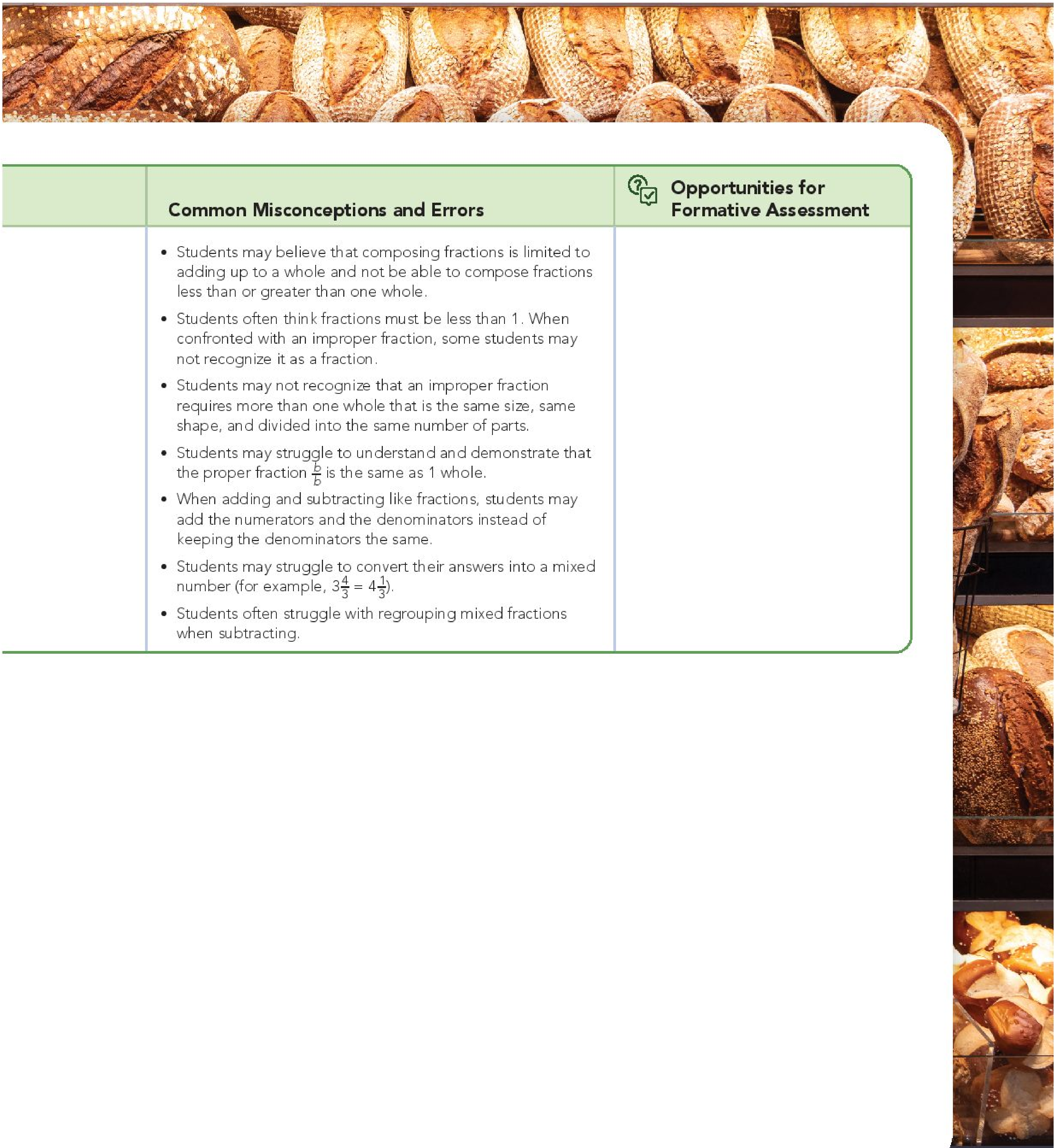


	Common Misconceptions and Errors	Opportunities for Formative Assessment
	• Students often think fractions must be less than 1. When confronted with an improper fraction, some students may not recognize it as a fraction. • Students sometimes try to simply flip the numerator and denominator of an improper fraction to make it more familiar. • Students may not recognize that an improper fraction requires more than one whole that is the same size, same shape, and divided into the same number of parts.	Error Analysis, Mixed to Improper, Food Fraction Fun, Practice, Check Your Understanding
	• Students may struggle to understand and demonstrate that the proper fraction $\frac{b}{b}$ is the same as 1 whole. • When adding and subtracting like fractions, students may add the numerators and the denominators instead of keeping the denominators the same.	Add Them Up, Break Them Down, Party Planning, Practice, Check Your Understanding
	• Students may struggle to convert their answers into a mixed number (for example, $3\frac{4}{3} = 4\frac{1}{3}$). • Students may add or otherwise change the denominator when adding.	Collecting Pineapple Juice, Mixed Together, Create Your Problem, Practice, Check Your Understanding
	• Students often struggle with regrouping mixed fractions when subtracting.	Error Analysis, Mixed Apart, Writing About Math, Practice, Check Your Understanding

Lesson Name	Materials for Lesson	Vocabulary Terms	Learning Objectives	
Concept Check-In and Remediation	• Materials may vary	Review concept vocabulary as needed.	• Students will work to correct misconceptions and errors related to composing and decomposing proper fractions, improper fractions, and mixed numbers.	

Opportunities for Assessment:

In addition to the assessment opportunities included in this chart, each concept will include a Concept Check-In.



	Common Misconceptions and Errors	Opportunities for Formative Assessment
	• Students may believe that composing fractions is limited to adding up to a whole and not be able to compose fractions less than or greater than one whole. • Students often think fractions must be less than 1. When confronted with an improper fraction, some students may not recognize it as a fraction. • Students may not recognize that an improper fraction requires more than one whole that is the same size, same shape, and divided into the same number of parts. • Students may struggle to understand and demonstrate that the proper fraction $\frac{b}{b}$ is the same as 1 whole. • When adding and subtracting like fractions, students may add the numerators and the denominators instead of keeping the denominators the same. • Students may struggle to convert their answers into a mixed number (for example, $3\frac{4}{3} = 4\frac{1}{3}$). • Students often struggle with regrouping mixed fractions when subtracting.	

UNIT
9

CONCEPT 1

Composing and Decomposing Fractions

LESSON 1
Let's Build It

Lesson Overview

In this lesson, students review what a unit fraction is and identify unit fractions. Students also learn how to compose non-unit fractions with unit fractions. Students join parts referring to the same whole.

Lesson Essential Question

- How are fractions composed and decomposed?

Learning Objectives

In this lesson

- Students will define unit fractions.
- Students will identify unit fractions.
- Students will compose other fractions with unit fractions.

Grade-Level Standards

4.B.2 Build fractions from unit fractions.

4.B.2.a Demonstrate understanding of fraction $\frac{a}{b}$ with $a > 1$ as a sum of fractions $\frac{1}{b}$.

i. Explain addition and subtraction of fractions as joining and separating parts referring to the same whole.

Vocabulary Check-In

compose, denominator, fraction, numerator, unit fraction

Materials List

- Chart paper or poster board
- Markers

Photo Credit: YesPhotographers / Shutterstock.com

DIGITAL

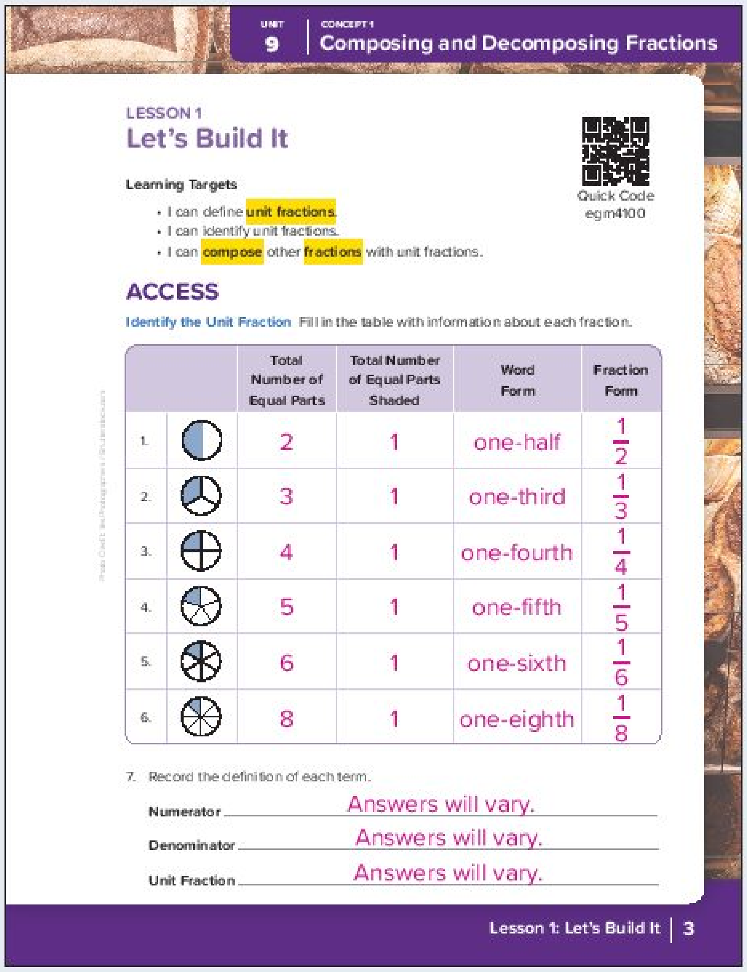
Lesson 1

Let's Build It

Quick Code:
egmt4100

PRINT

Student Page 3



UNIT 9 | CONCEPT 1 Composing and Decomposing Fractions

LESSON 1

Let's Build It

Quick Code egm4100

Learning Targets

- I can define unit fractions.
- I can identify unit fractions.
- I can compose other fractions with unit fractions.

ACCESS

Identify the Unit Fraction Fill in the table with information about each fraction.

		Total Number of Equal Parts	Total Number of Equal Parts Shaded	Word Form	Fraction Form
1.		2	1	one-half	$\frac{1}{2}$
2.		3	1	one-third	$\frac{1}{3}$
3.		4	1	one-fourth	$\frac{1}{4}$
4.		5	1	one-fifth	$\frac{1}{5}$
5.		6	1	one-sixth	$\frac{1}{6}$
6.		8	1	one-eighth	$\frac{1}{8}$

7. Record the definition of each term.

Numerator Answers will vary.

Denominator Answers will vary.

Unit Fraction Answers will vary.

Lesson 1: Let's Build It | 3

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

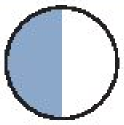
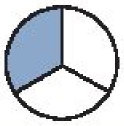
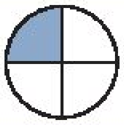
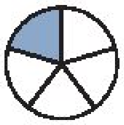
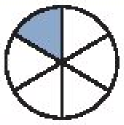
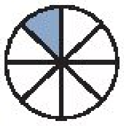
- Students may try to partition a whole into unequal shares. For example, the student may identify one-fourth as 1 of 4 parts, rather than 1 of 4 equal parts.
- Students may believe that composing fractions is limited to adding up to a whole and not be able to compose fractions less than or greater than one whole.
- Students may not equate composing fractions with addition.
- Students may struggle to understand that a fraction is composed of individual unit fractions added together.

Identify the Unit Fraction

1. Direct students to Lesson 1 ACCESS Identify the Unit Fraction and chorally read the Learning Targets.
2. Ask students to share with a partner what they know about fractions.
3. Use Calling Sticks to choose a few students to share their ideas. Be sure to review and discuss the following:
   - The terms *numerator* and *denominator*
   - The numerator and denominator are separated by a line
   - The denominator represents the total number of equal parts
   - The numerator shows how many of the total equal parts we have
4. Direct students to Lesson 1 ACCESS Identify the Unit Fraction and ask them to look at the first row of the table.

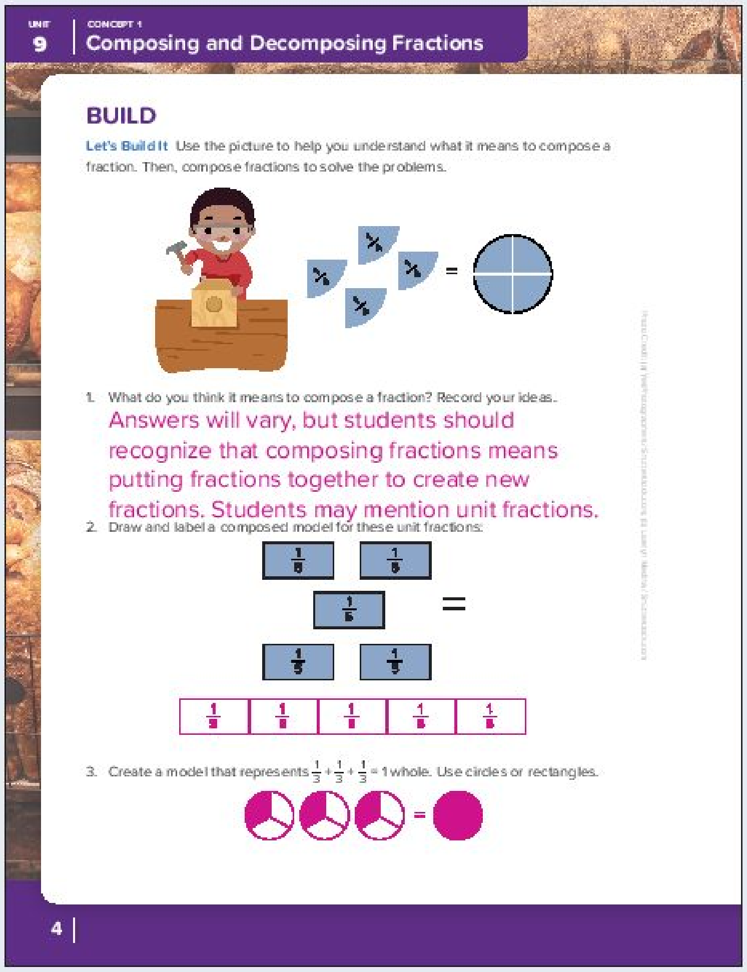
5. Work through Problem 1 with students, discussing the total number of equal parts (2, representing the denominator), the total number of shaded equal parts (1, representing the numerator), the word form (one-half), and the fraction form $\left(\frac{1}{2}\right)$. Reinforce that this is an example of a unit fraction because the numerator is one and the fraction represents one part of a whole.
6. Explain that each of the problems represents a unit fraction—a fraction with a numerator of 1. Ask students to complete Problems 2–7 to explore unit fractions (students may work independently or with a partner).
7. After a few minutes, review the answers as a class, clarifying any misconceptions.
8. On a sheet of chart paper or poster board, begin a Fraction Anchor Chart with the terms *numerator*, *denominator*, and *unit fraction*. Record definitions for each term on the Anchor Chart and have students record them in their Student Materials. This Anchor Chart will serve as a reference for students throughout the unit and will be expanded as students add new information.

Answer Key for Identify the Unit Fraction:

	Total Number of Equal Parts	Total Number of Equal Parts Shaded	Word Form	Fraction Form
	2	1	one-half	$\frac{1}{2}$
	3	1	one-third	$\frac{1}{3}$
	4	1	one-fourth	$\frac{1}{4}$
	5	1	one-fifth	$\frac{1}{5}$
	6	1	one-sixth	$\frac{1}{6}$
	8	1	one-eighth	$\frac{1}{8}$

PRINT

Student Page 4



UNIT 9 | CONCEPT 1 Composing and Decomposing Fractions

BUILD

Let's Build It Use the picture to help you understand what it means to compose a fraction. Then, compose fractions to solve the problems.

1. What do you think it means to compose a fraction? Record your ideas.
   Answers will vary, but students should recognize that composing fractions means putting fractions together to create new fractions. Students may mention unit fractions.
2. Draw and label a composed model for these unit fractions:
3. Create a model that represents $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}=1$ whole. Use circles or rectangles.

4

BUILD (40 min)

Let's Build It

1. Ask students to turn to Lesson 1 in their Student Materials and review the Learning Targets.
2. Tell students that they worked on the first Learning Target in ACCESS and now will work on the second Learning Target, using unit fractions to compose new fractions. Ask students to talk with their Shoulder Partner about what they remember from Theme 1 about composing numbers. Remind students that in Theme 1, they composed numbers using place value. For example, if we have 6 Thousands, 8 Hundreds, 1 Tens, and 2 Ones, we can compose that into the numeral 6,812.
3. Tell students that, before they compose fractions, they first need to make sure they understand relationships between numerators and denominators. Pose the following questions to students and discuss:

ASK

- *What is the relationship between the denominator and the size of the pieces in a unit fraction?*
  The bigger the denominator, the smaller the size of the piece.
- *Could one-eighth ever be larger than one-half?*
  Yes, if the size of the whole is bigger for the eighths than the halves. For example, one-eighth of a large cake will be bigger than one-half of a candy bar. Reinforce that the size of the whole matters.

4. Ask students to turn to Lesson 1 BUILD Let's Build It, look at the picture, and then explain what they think it means to compose fractions.
5. After a couple of minutes, ask volunteers to share their thinking. Reinforce that composing fractions means to build larger fractions, including a whole, from smaller fractions like unit fractions. In the picture, the carpenter had four unit fractions. When he put the four pieces together, it made a whole.

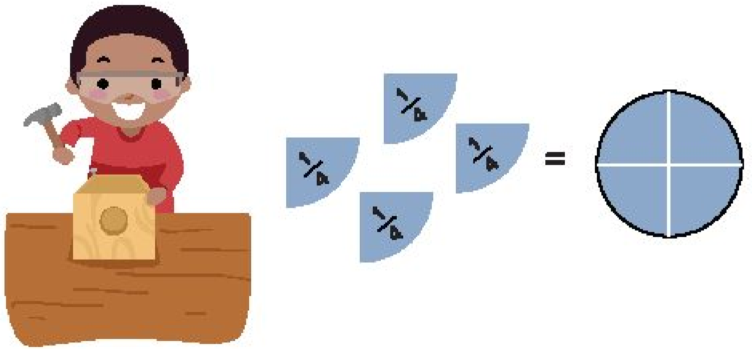
6. Pose the following questions to students and discuss:

ASK

- *How many unit fractions make a whole?*
  It depends on how many pieces the whole is broken into. For example, if the whole is broken into eighths, it will take eight pieces to compose a whole.
- *Do we always have to compose to a whole?*
  No. We can use unit fractions to create any non-unit fractions.
- *How many unit fractions of* $\frac{1}{4}$ *are needed to make* $\frac{3}{4}$*? How do you know?*
  3. The numerator tells us how many unit fractions are needed.
- *How could we write an equation to show the composing of* $\frac{3}{4}$ *with unit fractions?*
  $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{3}{4}$

7. Work with students to complete Problems 2–8.
8. During the last 3 minutes of BUILD, review the answers and clear up any misconceptions.
9. Add *compose* to the Fraction Anchor Chart with definition and example.

Answer Key for Let's Build It:



1. Students should recognize that composing fractions means putting fractions together to create new fractions. Students may mention unit fractions.

2.

$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$

Students may also draw the 5 pieces in a column.

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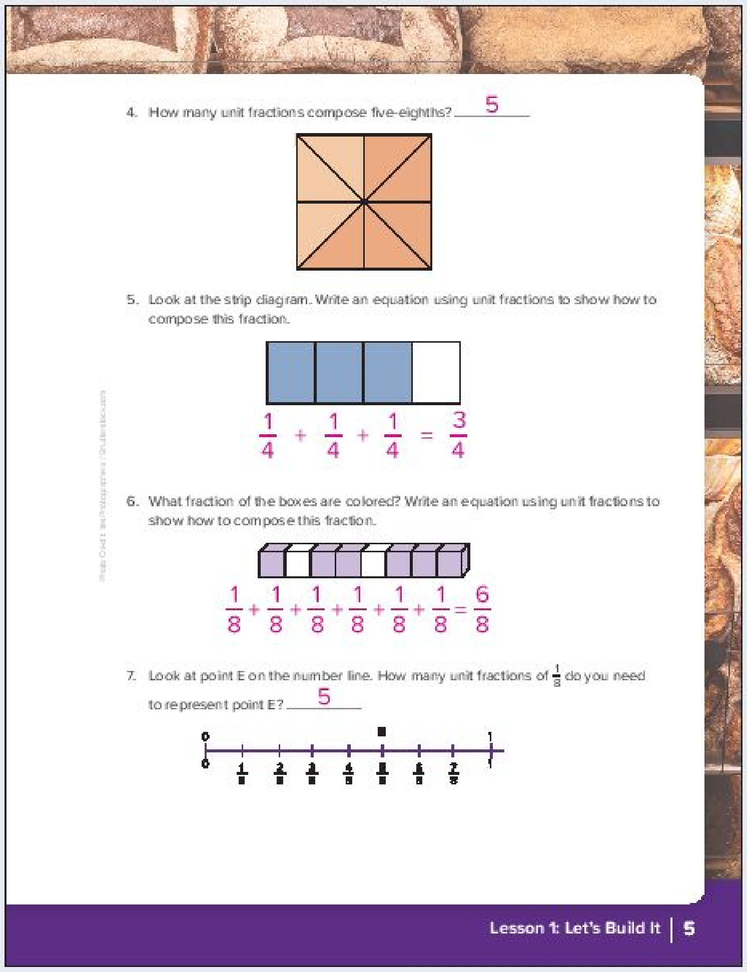
Student Page 5



4. How many unit fractions compose five-eighths? 5

5. Look at the strip diagram. Write an equation using unit fractions to show how to compose this fraction.

$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{3}{4}$

6. What fraction of the boxes are colored? Write an equation using unit fractions to show how to compose this fraction.

$\frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \frac{6}{8}$

7. Look at point E on the number line. How many unit fractions of $\frac{1}{8}$ do you need to represent point E? 5

Lesson 1: Let's Build It | 5

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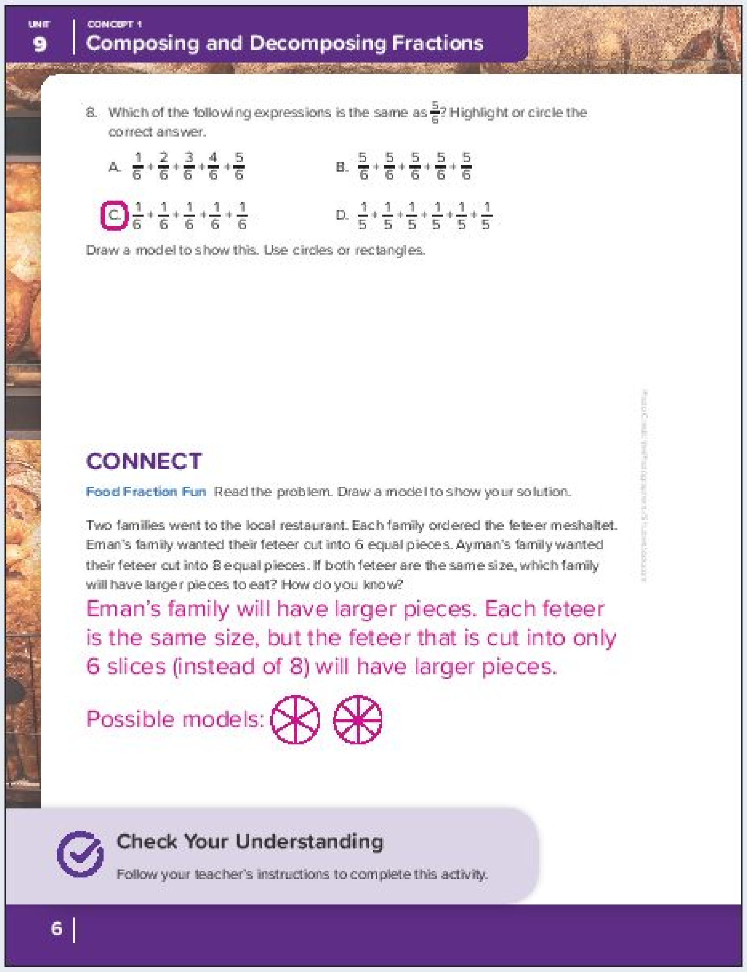
Student Page 6



UNIT 9 | CONCEPT 1

Composing and Decomposing Fractions

8. Which of the following expressions is the same as $\frac{5}{6}$? Highlight or circle the correct answer.

A. $\frac{1}{6}+\frac{2}{6}+\frac{3}{6}+\frac{4}{6}+\frac{5}{6}$ B. $\frac{5}{6}+\frac{5}{6}+\frac{5}{6}+\frac{5}{6}+\frac{5}{6}$

[✓ C.] $\frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}$ D. $\frac{1}{5}+\frac{1}{5}+\frac{1}{5}+\frac{1}{5}+\frac{1}{5}+\frac{1}{5}$

Draw a model to show this. Use circles or rectangles.

CONNECT

Food Fraction Fun Read the problem. Draw a model to show your solution.

Two families went to the local restaurant. Each family ordered the feteer meshaltet. Eman's family wanted their feteer cut into 6 equal pieces. Ayman's family wanted their feteer cut into 8 equal pieces. If both feteer are the same size, which family will have larger pieces to eat? How do you know?

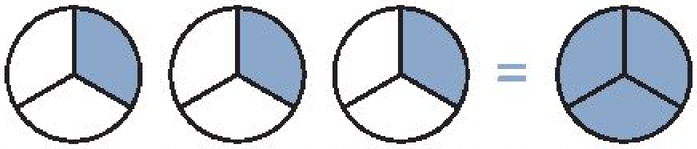
Eman's family will have larger pieces. Each feteer is the same size, but the feteer that is cut into only 6 slices (instead of 8) will have larger pieces.

Possible models:

Check Your Understanding

Follow your teacher's instructions to complete this activity.

6

3. 

Students may also draw a rectangular model.

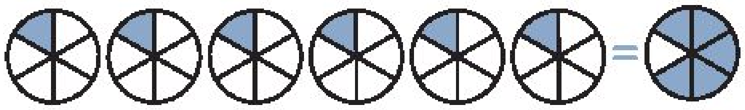
4. 5

5. $\frac{1}{4}+\frac{1}{4}+\frac{1}{4}=\frac{3}{4}$

6. $\frac{6}{8}$. $\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}=\frac{6}{8}$

7. 5

8. C.



Students may also draw rectangular models to represent $\frac{5}{6}$.

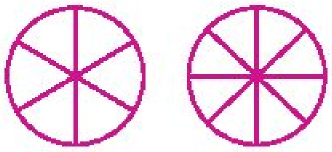
CONNECT (7 min)

Food Fraction Fun

Direct students to Lesson 1 CONNECT Food Fraction Fun and ask them to answer the question.

Eman's family will have larger pieces. Each feteer is the same size, but the feteer that is cut into only 6 slices (instead of 8) will have larger pieces.

Possible models:



WRAP-UP (3 min)

Let's Chat About Our Learning

Direct students to talk to their Shoulder Partner to answer the Essential Question: How are fractions composed? Use Calling Sticks to select students to share their thinking with the class.

Fractions may be composed by adding unit fractions together. If you think of 1 part of the whole, that gives you a unit fraction. When you put all of the unit fractions together, it equals the whole. We can also compose non-unit fractions that are less than a whole. The numerator tells how many unit fractions are needed.

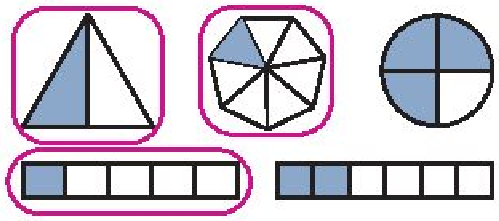
PRACTICE

Direct students to Lesson 1 PRACTICE and have them complete the problems. Address student errors and misconceptions around fractions.

Check Your Understanding

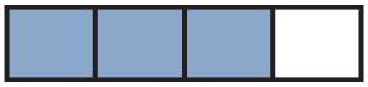
1. Circle all unit fractions.

[✓ $\frac{1}{8}$] $\frac{5}{6}$ [✓ $\frac{1}{3}$] [✓ $\frac{1}{10}$] $\frac{6}{7}$ $\frac{3}{4}$



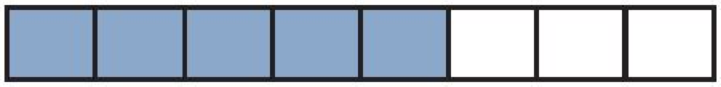
2. Write the composed fraction. Then, draw a model to represent the composed fraction.

$\frac{1}{4}+\frac{1}{4}+\frac{1}{4}=\frac{3}{4}$ Students may also draw a circle model.

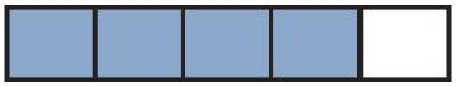


3. Write the composed fraction. Then, draw a model to represent the composed fraction.

$\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}=\frac{5}{8}$

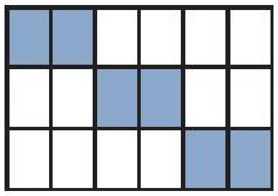


4. Use unit fractions to write an equation that represents the composed fraction.



$\frac{1}{5}+\frac{1}{5}+\frac{1}{5}+\frac{1}{5}=\frac{4}{5}$

5. Use unit fractions to write an equation that represents the composed fraction.



$\frac{1}{18}+\frac{1}{18}+\frac{1}{18}+\frac{1}{18}+\frac{1}{18}+\frac{1}{18}=\frac{6}{18}$

LESSON 2
Break It Down

Lesson Overview

In this lesson students decompose non-unit fractions into unit fractions. Students separate parts referring to the same whole.

Lesson Essential Question

- How are fractions composed and decomposed?

Learning Objective

In this lesson

- Students will decompose fractions into unit fractions.

Grade-Level Standard

4.B.2.a Demonstrate understanding of fraction $\frac{a}{b}$ with $a > 1$ as a sum of fractions $\frac{1}{b}$.

i. Explain addition and subtraction of fractions as joining and separating parts referring to the same whole.

Vocabulary Check-In

decompose, proper fraction

Materials List

- Unit 9 Lesson 2 Dominoes

Preparation

Photocopy the Blackline Master at the end of this volume. Save the dominoes for use in future lessons.

DIGITAL

Lesson 2

Break It Down

Quick Code:
egmt4101

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may struggle to understand that a fraction is composed of individual unit fractions added together.
- Students may not recognize that unit fractions cannot be decomposed. They can only be combined into larger fractions.

Fraction Charades

1. Direct students to Lesson 2 ACCESS Fraction Charades and chorally read the Learning Target.
2. Split students up into teams of various sizes (three students in one team, four students in another, and so on). Tell the teams that they will act out a unit fraction and the rest of the class will guess what their fraction is.
3. Teams will decide how to act out their fraction. For example, in a team of 3, 1 student might jump while the other 2 sit. The other teams may guess $\frac{1}{3}$ is the unit fraction because $\frac{1}{3}$ of the students are jumping.
4. Teams take turns acting while the other teams guess what the fraction is.

BUILD (40 min)

Decompose It (20 min)

1. Ask students to turn to Lesson 2 BUILD Decompose It, look at the picture, and explain what they think the term decompose means. Remind students that they also decomposed numbers in Theme 1 by looking at place value. For example, the number 573 can be decomposed into 5 Hundreds, 7 Tens, and 3 Ones. It can also be decomposed in other ways, including, for example, 5 Hundreds and 73 Ones.

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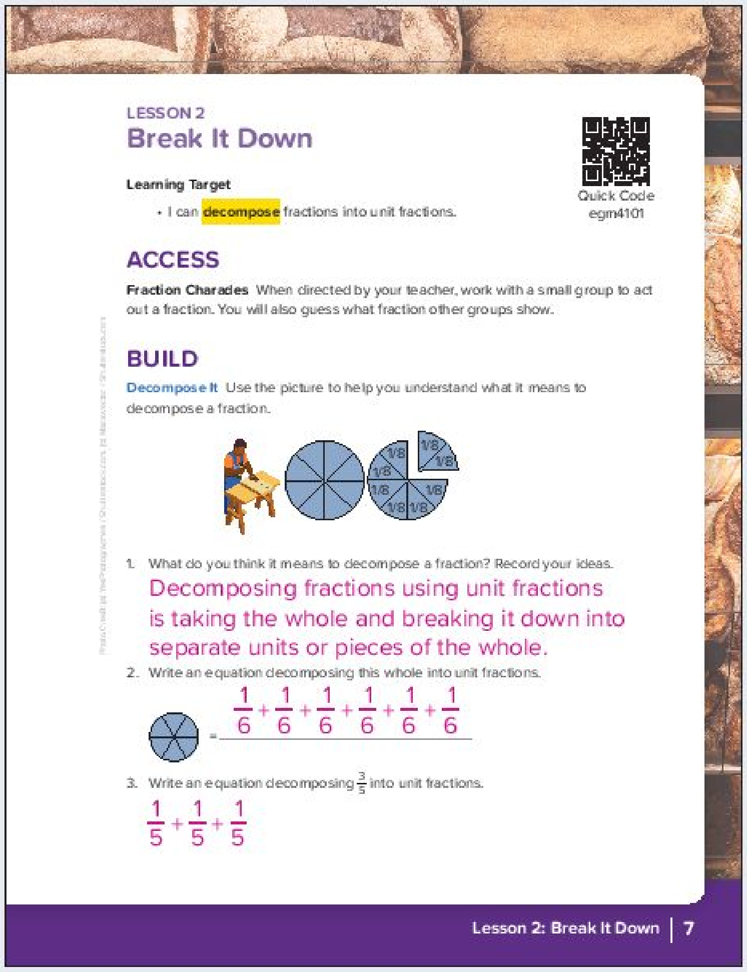
Student Page 7



LESSON 2

Break It Down

Learning Target

- I can decompose fractions into unit fractions.

Quick Code
egm4101

ACCESS

Fraction Charades When directed by your teacher, work with a small group to act out a fraction. You will also guess what fraction other groups show.

BUILD

Decompose It Use the picture to help you understand what it means to decompose a fraction.

1. What do you think it means to decompose a fraction? Record your ideas.
Decomposing fractions using unit fractions is taking the whole and breaking it down into separate units or pieces of the whole.
2. Write an equation decomposing this whole into unit fractions.
$= \frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}$
3. Write an equation decomposing $\frac{3}{5}$ into unit fractions.
$\frac{1}{5}+\frac{1}{5}+\frac{1}{5}$

Lesson 2: Break It Down | 7

2. After a couple of minutes, use Calling Sticks to hear explanations from a few students. Reinforce that decomposing fractions means to take a fraction apart and break it down into smaller parts like unit fractions. In the picture, the carpenter had a whole and when decomposed, he made 8 pieces of $\frac{1}{8}$.

3. Pose the following questions to students for discussion:

ASK

- *How are composing and decomposing alike?*
  They both involve smaller fractions, like unit fractions, and larger fractions.
- *How are composing and decomposing different?*
  Composing builds up and decomposing breaks down.
- *How could we decompose $\frac{3}{4}$?*
  $\frac{1}{4} + \frac{1}{4} + \frac{1}{4}$

TEACHER NOTE: Some students may suggest that $\frac{3}{4}$ could be decomposed into $\frac{2}{4}$ and $\frac{1}{4}$. While they are correct, reinforce that in this lesson we are decomposing, or breaking down, all fractions as far as we can go. This means we are breaking down to unit fractions.

4. Answer any student questions and then direct students to complete the remainder of the problems in Lesson 2 BUILD Decompose It.

5. After several minutes, have students review their answers with their Shoulder Partner.

Answer Key for Decompose It:

1. Decomposing fractions using unit fractions is taking the whole and breaking it down into separate units or pieces of the whole.
2. $\frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6}$
3. $\frac{1}{5} + \frac{1}{5} + \frac{1}{5}$

Domino Decomposing (20 min)

1. Introduce the rules for Domino Decomposing, found in Lesson 2 BUILD Domino Decomposing:
   - Place all dominoes face down on the table.
   - Pick one domino.
   - Record a fraction using the numbers on the domino. Use the smaller number as the numerator and the larger number as the denominator.
   - Decompose the fraction into unit fractions that when added together, will equal the original fraction.
   - Draw a model of your fraction.
   - Repeat until the game sheet is complete.

2. As students play, walk around to offer support and correct misconceptions and errors. After students play, remind them to place a star next to the domino that represents the largest fraction and write a justification sentence.
3. When students are finished, ask students to share their largest fraction and its decomposition with their Shoulder Partner.
4. Ask a few students to share the largest fraction and its decomposition from their shoulder pairs.

CONNECT (7 min)

Food Fraction Fun

Ask students to turn to Lesson 2 CONNECT Food Fraction Fun and answer the question.

Answer Key for Food Fraction Fun:

$\frac{1}{4}+\frac{1}{4}+\frac{1}{4}=\frac{3}{4}$. Mazen will need to fill the measuring cup three times for his recipe.

WRAP-UP (3 min)

Let's Chat About Our Learning

Ask volunteers to share their answers to the CONNECT question. Ask students to discuss how they used what they know about numerators, denominators, and decomposing fractions to solve the problem. Students may explain that the numerator told them they would need 3 unit fractions and the denominator told them the denominator of each unit fraction.

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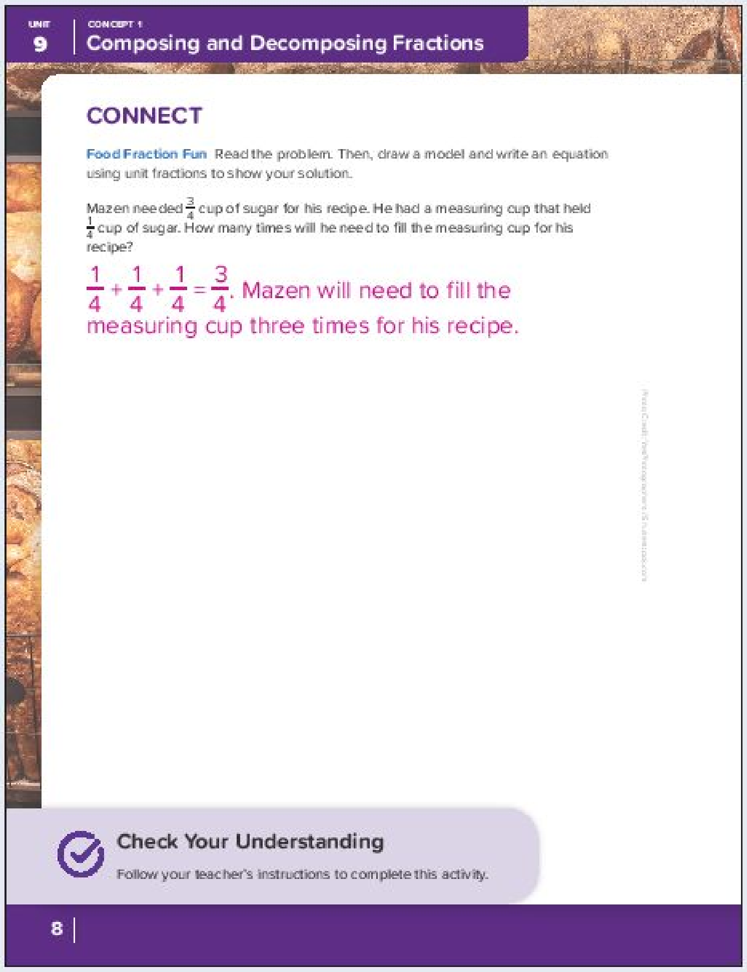
Student Page 8



UNIT 9 | CONCEPT 1 Composing and Decomposing Fractions

CONNECT

Food Fraction Fun Read the problem. Then, draw a model and write an equation using unit fractions to show your solution.

Mazen needed $\frac{3}{4}$ cup of sugar for his recipe. He had a measuring cup that held $\frac{1}{4}$ cup of sugar. How many times will he need to fill the measuring cup for his recipe?

$\frac{1}{4}+\frac{1}{4}+\frac{1}{4}=\frac{3}{4}$. Mazen will need to fill the measuring cup three times for his recipe.

Check Your Understanding

Follow your teacher's instructions to complete this activity.

8

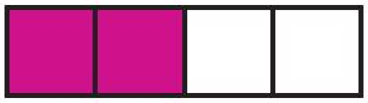
PRACTICE

Direct students to Lesson 2 PRACTICE and have them complete the problems. Address student errors and misconceptions around unit fractions.

Check Your Understanding

1. Shade the model to solve.

$$\frac{\boxed{1}}{\boxed{4}} + \frac{\boxed{1}}{\boxed{4}} = \frac{\boxed{2}}{\boxed{4}}$$

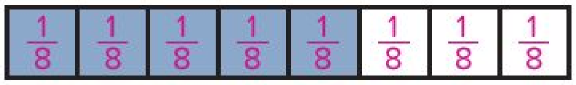


2. Using unit fractions, write an equation to show how you would decompose the fraction $\frac{4}{9}$.

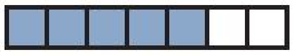
$\frac{4}{9} = \frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9}$

3. Draw and solve. How many $\frac{1}{8}$ pieces are in $\frac{5}{8}$?

5

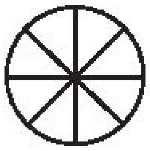


4. Write a number sentence to decompose the following fraction using unit fractions.



$\frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7} = \frac{5}{7}$

5. The circle represents one whole. Decompose the circle into unit fractions.



$\frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8}$

LESSON 3
Break It Down Again

Lesson Overview

In this lesson, students extend their understanding of composing and decomposing. Students construct various fractions using unit and non-unit fractions and represent this construction with repeated addition. They join and separate the parts referring to the same whole and decompose a fraction into a sum of fractions with the same denominator in more than one way. This work helps students continue to build deep understanding of fractions.

Lesson Essential Question

- How are fractions composed and decomposed?

Learning Objective

In this lesson

- Students will represent fractions with repeated addition and subtraction of unit and other fractions.

Grade-Level Standards

4.B.2 Build fractions from unit fractions.

4.B.2.a Demonstrate understanding of fraction $\frac{a}{b}$ with $a > 1$ as a sum of fractions $\frac{1}{b}$.

i. Explain addition and subtraction of fractions as joining and separating parts referring to the same whole.

ii. Decompose a fraction into a sum of fractions with the same denominator in more than one way.

Vocabulary Check-In

compose, decompose, non-unit fraction, relay race, unit fraction, whole

Materials List

- Unit 9 Lesson 3 I Have . . . Who Has . . . ? Cards

Preparation

Photocopy cards at the end of this volume.

Photo Credit: Robyn Mackenzie / Shutterstock.com

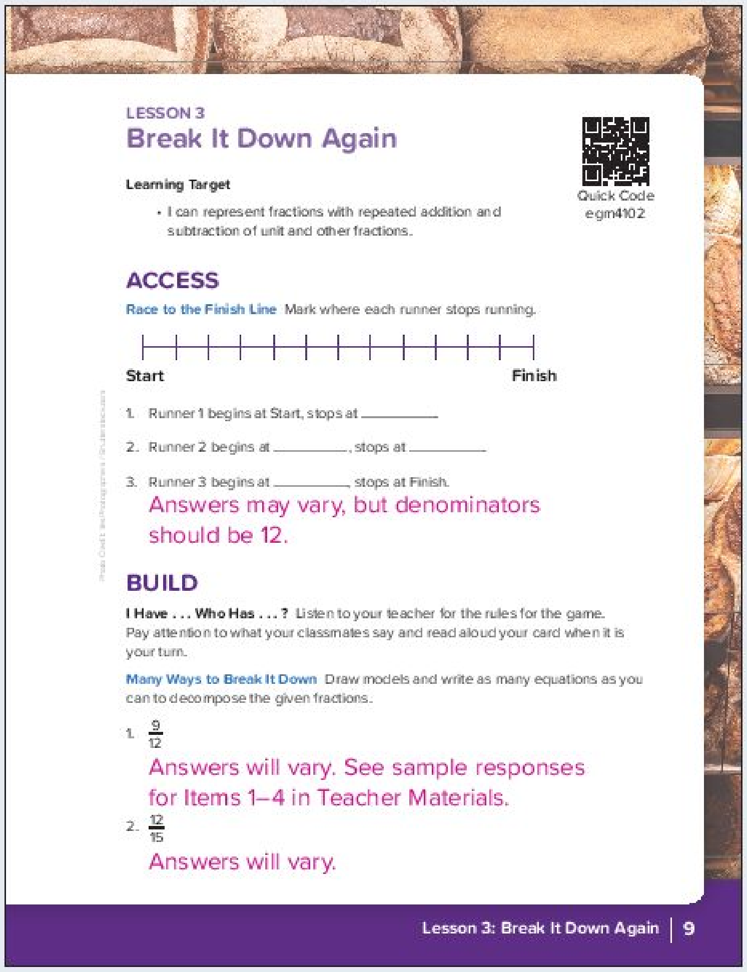
DIGITAL

Lesson 3
Break It Down Again

Quick Code:
egmt4102

PRINT

Student Page 9



LESSON 3

Break It Down Again

Quick Code
egm4102

Learning Target

- I can represent fractions with repeated addition and subtraction of unit and other fractions.

ACCESS

Race to the Finish Line Mark where each runner stops running.

Start Finish

1. Runner 1 begins at Start, stops at ________
2. Runner 2 begins at ________, stops at ________
3. Runner 3 begins at ________, stops at Finish.

Answers may vary, but denominators should be 12.

BUILD

I Have . . . Who Has . . . ? Listen to your teacher for the rules for the game. Pay attention to what your classmates say and read aloud your card when it is your turn.

Many Ways to Break It Down Draw models and write as many equations as you can to decompose the given fractions.

1. $\frac{9}{12}$

Answers will vary. See sample responses for Items 1–4 in Teacher Materials.

2. $\frac{12}{15}$

Answers will vary.

Lesson 3: Break It Down Again | 9

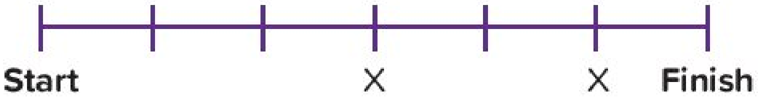
ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may believe that fractions can be composed from or decomposed into unit fractions exclusively. However, they can be decomposed in many different ways.

Race to the Finish Line (10 min)

1. Ask students to turn to Lesson 3 in their Student Materials and read the Learning Target aloud with you. Ask students to do a Fist-to-Five to self-assess their confidence with decomposing fractions.
2. Explain to students that they are going to look at decomposing in a new way—as a relay race. Explain that a relay race is a race where a small team runs the whole distance, but each runner only runs a part of the whole.
3. Draw a line on the board with a start and finish line. Divide the line into 6 equal parts as shown. Mark an X (or other mark) at the following points on the line:

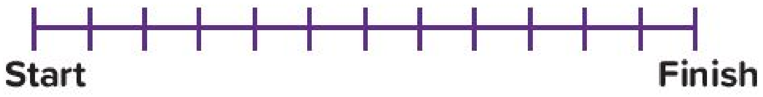


4. Ask students to identify how many parts are in this race and what fraction represents each of the parts. 6, so the line is divided into sixths
5. Tell students that in this race, there were 3 runners on the relay team. The first runner ran from the start to the first X where the second runner was waiting. The second runner ran from the first X to the second X where the third runner was waiting. The third runner ran to the finish line. Ask students to discuss the race with their Shoulder Partner and determine what fraction of the race each of the runners ran. Runner 1 ran $\frac{3}{6}$ (or $\frac{1}{2}$), Runner 2 ran $\frac{2}{6}$, and Runner 3 ran $\frac{1}{6}$ of the whole race.

   TEACHER NOTE: If helpful, have students act out the relay race, especially if this is a new concept for them.

6. Direct students to turn to Lesson 3 ACCESS Race to the Finish Line.

7. Draw the new race diagram on the board (as shown).



8. Ask students to identify how many parts are in this race and what fraction represents each part.
   12 parts, or twelfths

9. Divide students into groups of 3 and ask them to work together to identify ways a relay team could run this race. Remind students that each runner does not have to run the same distance. Students should represent their ideas in their Student Materials.

10. After a few minutes, as students to share their work and their thinking. How did each team divide up their race? If time allows, confirm the work of a few groups by having them show it on the board and write out an equation (for example, $\frac{5}{12} + \frac{3}{12} + \frac{4}{12} = \frac{12}{12}$ or 1).

Answer Key for Race to the Finish Line:

The fractions of the race run by each team member (the numerators) may vary, but the denominators should be 12. The numerators should add to equal a total of 12 or $\frac{12}{12} = 1$

BUILD (35 min)

I Have . . . Who Has . . . ? (20 min)

1. Tell students that they will play "I Have... Who Has...?" and distribute the cards.

   TEACHER NOTE: There are 30 cards. If your class has fewer than 30 students, a student may have more than 1 card. If your class has more than 30 students, you may pair up your students and give 1 card per pair.

2. Choose any student to begin and have them read their card to the class.

3. The student who has the answer to the previous student's question will stand and read his or her card next.

4. This will repeat until the game finishes with the starting student.

   TEACHER NOTE: This is a great opportunity to work with a couple of the problems on the board. You may challenge the students and ask them for another way to write an equation to decompose. You may also draw models to show students what it looks like visually.

Many Ways to Break It Down (15 min)

1. Direct students to Lesson 3 BUILD Many Ways to Break It Down. Instruct students that they should think creatively and come up with as many ways as they can to decompose the given fractions.

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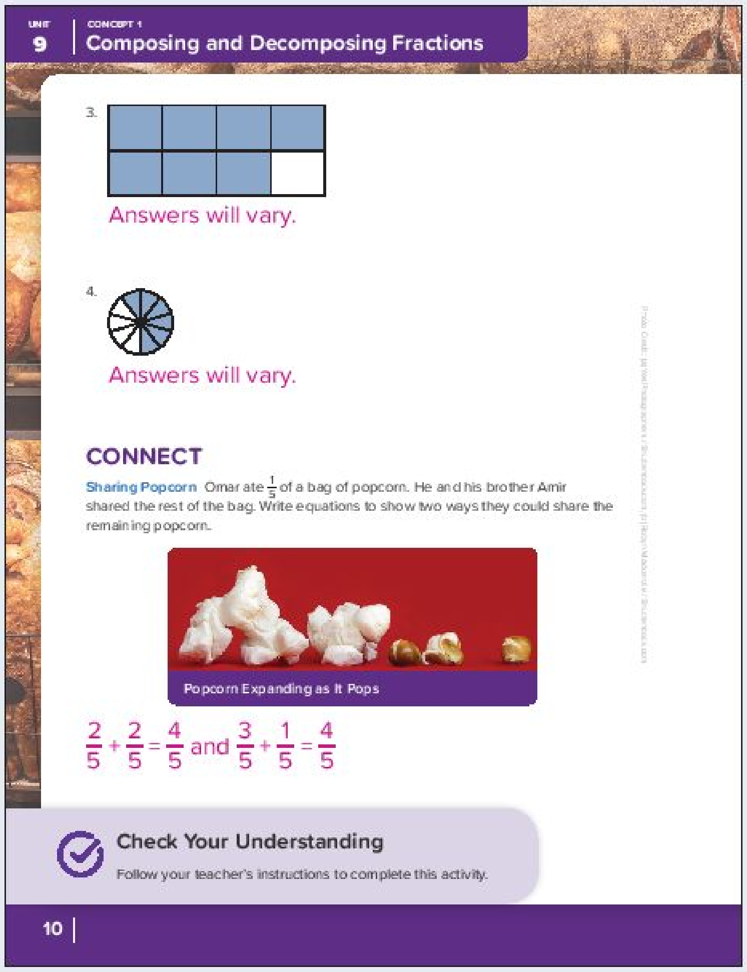
Student Page 10



UNIT 9 | CONCEPT 1 Composing and Decomposing Fractions

3\.

Answers will vary.

4\.

Answers will vary.

CONNECT

Sharing Popcorn Omar ate $\frac{1}{5}$ of a bag of popcorn. He and his brother Amir shared the rest of the bag. Write equations to show two ways they could share the remaining popcorn.

Popcorn Expanding as It Pops

$\frac{2}{5} + \frac{2}{5} = \frac{4}{5}$ and $\frac{3}{5} + \frac{1}{5} = \frac{4}{5}$

Check Your Understanding

Follow your teacher's instructions to complete this activity.

10

2. During the last 3 minutes of BUILD, have volunteers share their answers, build on each other's thinking by adding other ways, and clear up any misconceptions.

Answer Key for Many Ways to Break It Down:

Sample answers are shown. There are other possible answers:

1. $\frac{9}{12} = \frac{1}{12} + \frac{1}{12} + \frac{1}{12} + \frac{1}{12} + \frac{1}{12} + \frac{1}{12} + \frac{1}{12} + \frac{1}{12} + \frac{1}{12}$
   $\frac{4}{12} + \frac{5}{12}$
   $\frac{2}{12} + \frac{3}{12} + \frac{4}{12}$
2. $\frac{12}{15} = \frac{5}{15} + \frac{7}{15}$
   $\frac{3}{15} + \frac{8}{15} + \frac{1}{15}$
   $\frac{1}{15} + \frac{6}{15} + \frac{5}{15}$
3. $\frac{7}{8} = \frac{1}{8} + \frac{6}{8}$
   $\frac{2}{8} + \frac{3}{8} + \frac{2}{8}$
   $\frac{3}{8} + \frac{1}{8} + \frac{3}{8}$
4. $\frac{6}{10} = \frac{1}{10} + \frac{2}{10} + \frac{3}{10}$
   $\frac{2}{10} + \frac{4}{10}$
   $\frac{5}{10} + \frac{1}{10}$
   $\frac{2}{10} + \frac{2}{10} + \frac{2}{10}$

CONNECT (7 min)

Sharing Popcorn

Ask students to turn to Lesson 3 Sharing Popcorn to solve the problem and write their own story problem.

Answer Key for Sharing Popcorn:

$\frac{2}{5} + \frac{2}{5} = \frac{4}{5}$ and $\frac{3}{5} + \frac{1}{5} = \frac{4}{5}$

TEACHER NOTE: Consider using students' story problems as a formative assessment to determine how well they understand the meaning and process of decomposing fractions.

WRAP-UP (3 min)

Let's Chat About Our Learning

Ask Shoulder Partners to swap books and solve each other's story problems. Partners should check each other's work and help each other clear up misconceptions and errors.

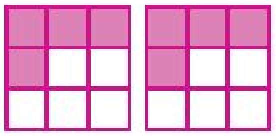
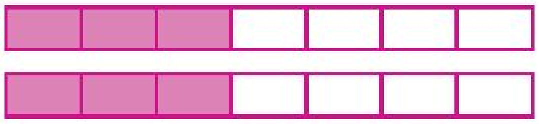
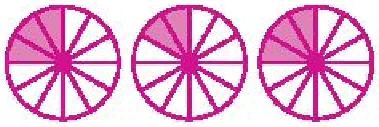
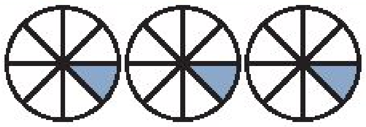
PRACTICE

Direct students to Lesson 3 PRACTICE and have them complete the problems. Address student errors and misconceptions around decomposing fractions.

Check Your Understanding

Complete the table.

Possible answers are shown. Accept all answers that show correct decomposition and modeling of each fraction.

Fraction	Decompose #1	Decompose #2	Model Decomposed
$\frac{8}{9}$	$\frac{4}{9}+\frac{4}{9}$	$\frac{2}{9}+\frac{2}{9}+\frac{4}{9}$	
$\frac{6}{7}$	$\frac{1}{7}+\frac{3}{7}+\frac{2}{7}$	$\frac{3}{7}+\frac{3}{7}$	
$\frac{9}{12}$	$\frac{1}{12}+\frac{2}{12}+\frac{6}{12}$	$\frac{2}{12}+\frac{3}{12}+\frac{4}{12}$	
$\frac{3}{8}$	$\frac{1}{8}+\frac{1}{8}+\frac{1}{8}$	$\frac{1}{8}+\frac{2}{8}$	
Create your own.	Answers will vary.		

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LESSON 4
All Mixed Up

Lesson Overview

In this lesson, students begin to explore mixed numbers and improper fractions as they relate to and build upon unit fractions. They learn that these types of fractions are greater than 1. Students model how, for example, $\frac{3}{4}$ and another $\frac{1}{4}$ makes a whole, but then when we add another $\frac{1}{4}$, we end up with a whole and a fourth, or $1\frac{1}{4}$, or $\frac{5}{4}$.

Lesson Essential Question

- How are fractions composed and decomposed?

Learning Objectives

In this lesson

- Students will define mixed numbers.
- Students will define improper fractions.
- Students will explain how mixed numbers and improper fractions relate to unit fractions.

Grade-Level Standard

4.B.2.d Add and subtract mixed numbers with like denominators using equivalent fractions or properties of operations and the relationship between addition and subtraction.

Vocabulary Check-In

denominator, equivalent, improper fraction, mixed number, numerator, proper fraction

Materials List

- Fraction Anchor Chart

DIGITAL

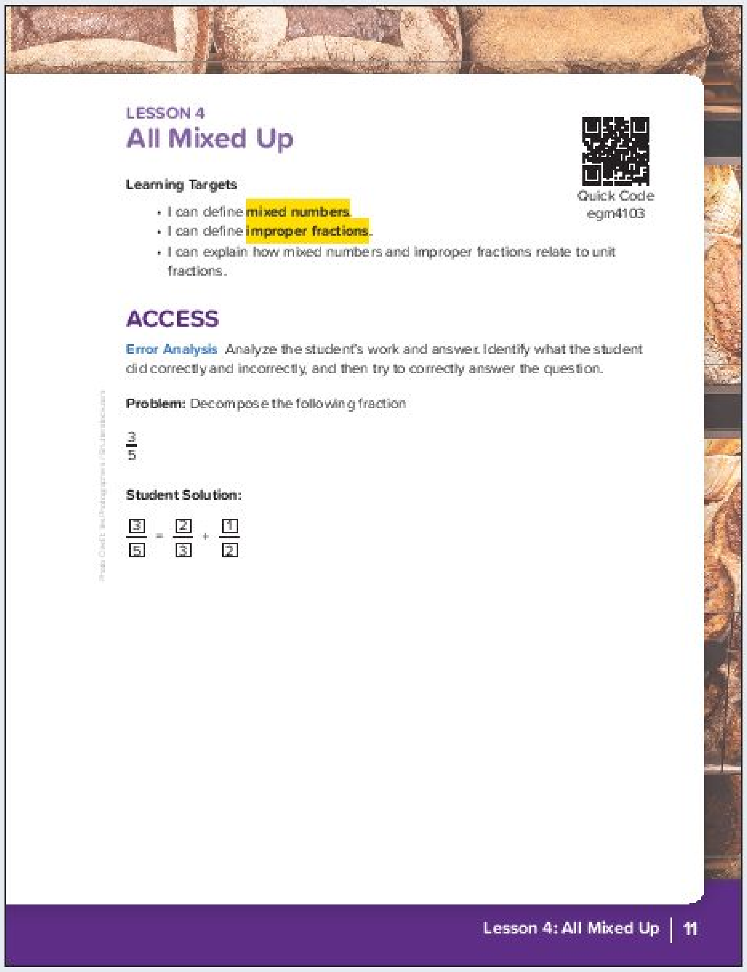
Lesson 4
All Mixed Up

Quick Code:
egmt4103

Photo Credit: YesPhotographers / Shutterstock.com

PRINT

Student Page 11



LESSON 4

All Mixed Up

Quick Code
egm4103

Learning Targets

- I can define **mixed numbers**.
- I can define **improper fractions**.
- I can explain how mixed numbers and improper fractions relate to unit fractions.

ACCESS

Error Analysis Analyze the student's work and answer. Identify what the student did correctly and incorrectly, and then try to correctly answer the question.

Problem: Decompose the following fraction

$\frac{3}{5}$

Student Solution:

$\frac{\boxed{3}}{\boxed{5}} = \frac{\boxed{2}}{\boxed{3}} + \frac{\boxed{1}}{\boxed{2}}$

Lesson 4: All Mixed Up | 11

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students often think fractions must be less than 1. When confronted with an improper fraction, some students may not recognize it as a fraction.
- Students sometimes try to simply flip the numerator and denominator of an improper fraction to make it more familiar.
- Students may not recognize that an improper fraction requires more than one whole that is the same size, same shape, and divided into the same number of parts.

Error Analysis

1. Direct students to Lesson 4 ACCESS Error Analysis and ask them to complete the error analysis.
2. Review the answers to the error analysis.

Answer Key for Error Analysis:

Students should note that the student incorrectly decomposed the fraction. The numerators are correct, but the denominators are not. Reinforce that when decomposing fractions, the denominator stays the same as the given fraction and that the numerators may be changed so that their sum will equal the original numerator.

BUILD (40 min)

Improper Fractions (20 min)

1. Write the improper fraction $\frac{3}{2}$ on the board and ask students what they notice about the fraction.
   Students should respond that the numerator is larger than the denominator.
2. Ask students to turn to Lesson 4 ACCESS Improper Fractions and work with a partner to solve Problem 1.

   TEACHER NOTE: As students work, walk around to find a few different ways to show $\frac{3}{2}$. It is appropriate for students to struggle with this concept at this point in the lesson. For example, some students may show $\frac{2}{3}$ instead of $\frac{3}{2}$. Some students may not understand how to make more than a whole. All of these misunderstandings present an opportunity for great math conversation in the next step.
3. After a few minutes, display a few models students made on the board. Ask students the following questions to guide their understanding:

ASK

- *What do you notice about these different models?*
  Answers will vary.
- *Are any of them similar?*
  Answers will vary.
- *How are they different?*
  Answers will vary.
- *What does the numerator tell us in this fraction?*
  There should be 3 parts colored in.
- *What does the denominator tell us in this fraction?*
  There should be a whole, or more than a whole divided into 2 parts.

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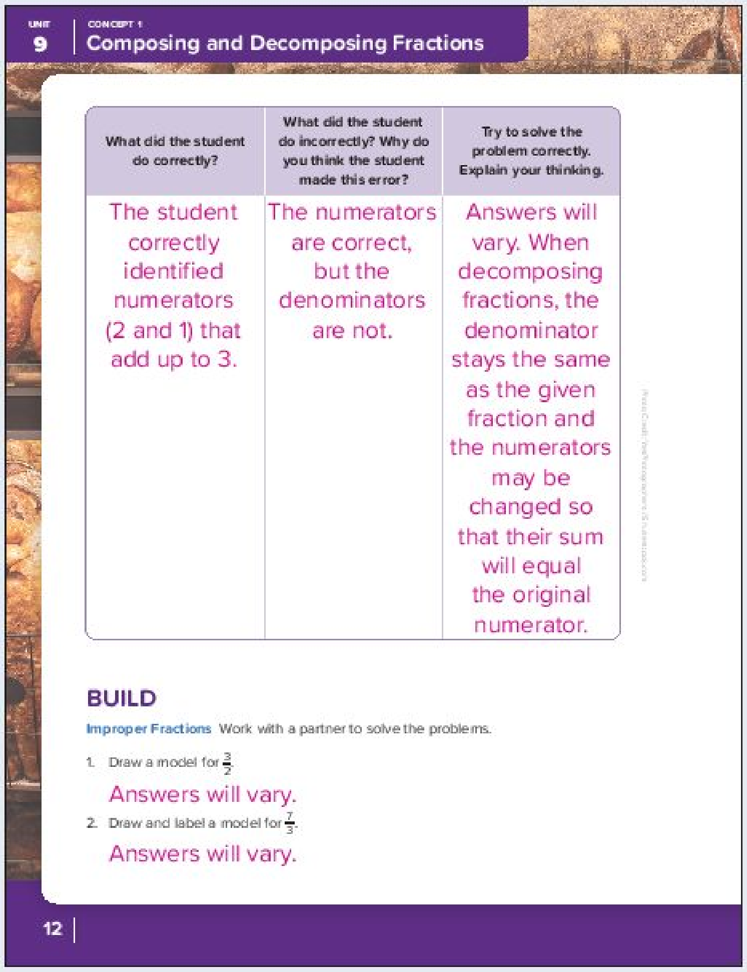
Student Page 12



UNIT 9 | CONCEPT 1
Composing and Decomposing Fractions

What did the student do correctly?	What did the student do incorrectly? Why do you think the student made this error?	Try to solve the problem correctly. Explain your thinking.
The student correctly identified numerators (2 and 1) that add up to 3.	The numerators are correct, but the denominators are not.	Answers will vary. When decomposing fractions, the denominator stays the same as the given fraction and the numerators may be changed so that their sum will equal the original numerator.

BUILD

Improper Fractions Work with a partner to solve the problems.

1. Draw a model for $\frac{3}{2}$.
   Answers will vary.
2. Draw and label a model for $\frac{7}{3}$.
   Answers will vary.

12

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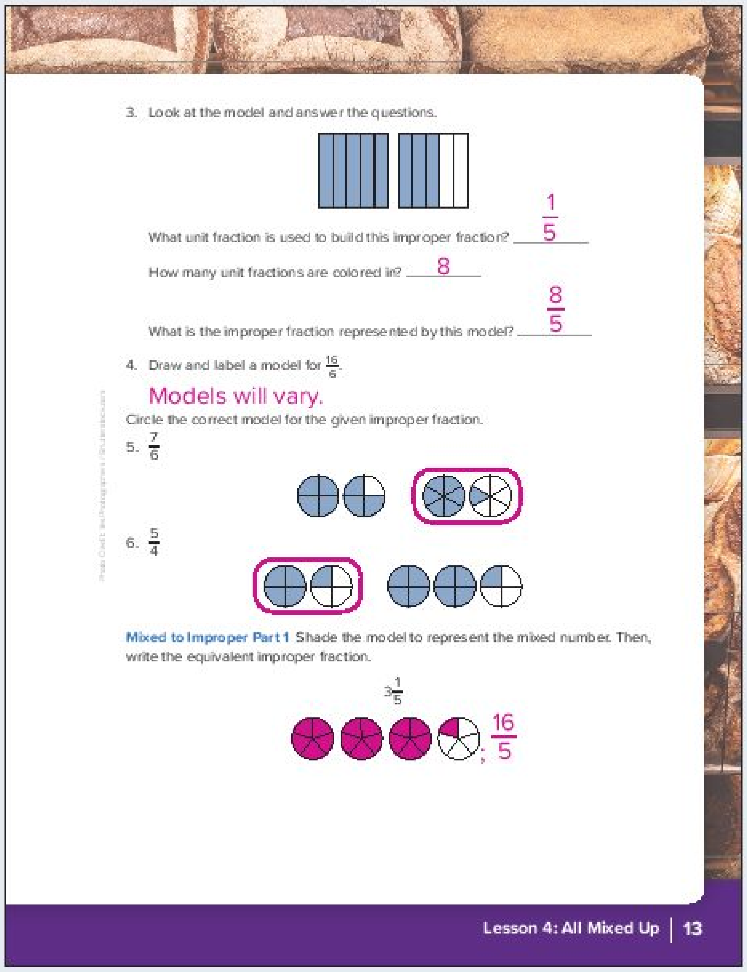
Student Page 13



3. Look at the model and answer the questions.

What unit fraction is used to build this improper fraction? $\frac{1}{5}$

How many unit fractions are colored in? 8

What is the improper fraction represented by this model? $\frac{8}{5}$

4. Draw and label a model for $\frac{16}{6}$.

Models will vary.

Circle the correct model for the given improper fraction.

5. $\frac{7}{6}$

6. $\frac{5}{4}$

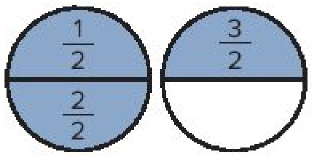
Mixed to Improper Part 1 Shade the model to represent the mixed number. Then, write the equivalent improper fraction.

$3\frac{1}{5}$

; $\frac{16}{5}$

Lesson 4: All Mixed Up | 13

4. Tell students that when the numerator is larger than the denominator, it is called an improper fraction. It also means that the fraction is greater than 1. Reinforce by counting by halves with a correct student model (or draw a correct model on the board as shown).



5. Ask students what they notice about this model. Students should recognize that one of the models is shaded completely in; that both circles are the same size and divided into the same number of parts; that two circles were needed since the improper fraction is more than one whole.

6. If students would benefit from seeing another example, build a similar model with $\frac{5}{3}$, showing 2 circles divided into thirds, then count $\frac{1}{3}$, $\frac{2}{3}$, $\frac{3}{3}$ or 1 whole, $\frac{4}{3}$, $\frac{5}{3}$.

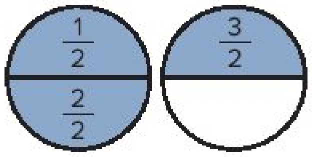
7. Direct students' attention back to Lesson 4 BUILD Improper Fractions. Ask students to continue to work with their partner to solve Problems 2–6.

8. When there are a few minutes left in BUILD, go over the answers with the class and discuss any problems students might have struggled with or felt proud of.

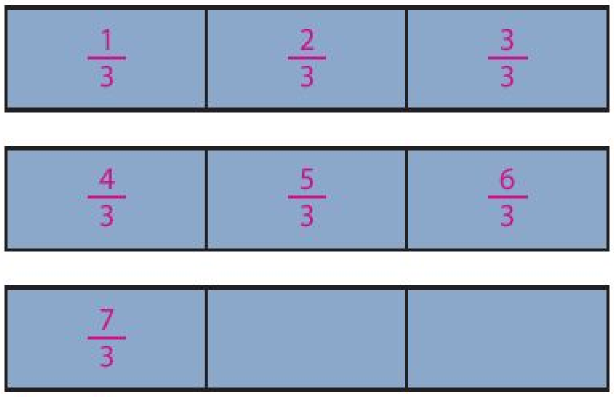
9. Add "Improper Fraction" to the Fraction Anchor Chart with a definition and example.

Answer Key to Improper Fractions:

1. Sample answer:

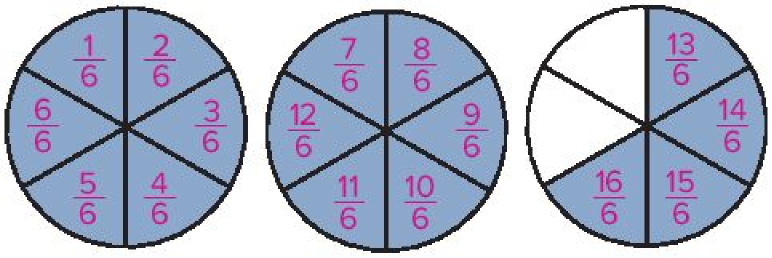


2.


$\frac{1}{3}$
$\frac{2}{3}$
$\frac{3}{3}$
$\frac{4}{3}$
$\frac{5}{3}$
$\frac{6}{3}$
$\frac{7}{3}$

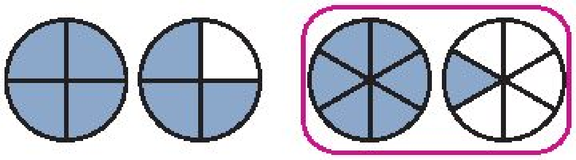
3. $\frac{1}{5}$; 8; $\frac{8}{5}$

4. Models will vary. Accept as correct all models with 6 equal sections with 16 shaded and labeled parts. Sample answer:

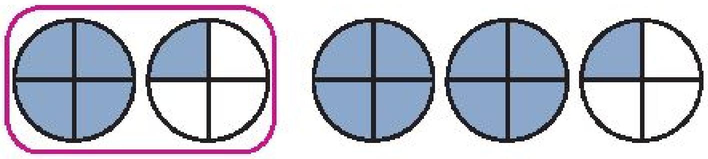

$\frac{1}{6}$
$\frac{2}{6}$
$\frac{3}{6}$
$\frac{4}{6}$
$\frac{5}{6}$
$\frac{6}{6}$
$\frac{7}{6}$
$\frac{8}{6}$
$\frac{9}{6}$
$\frac{10}{6}$
$\frac{11}{6}$
$\frac{12}{6}$
$\frac{13}{6}$
$\frac{14}{6}$
$\frac{15}{6}$
$\frac{16}{6}$

5. Circle the correct model for the given improper fraction.

$\frac{7}{6}$



6. $\frac{5}{4}$



Mixed to Improper, Parts 1–3 (20 min)

1. Tell students that now that they can define and model improper fractions, they will explore mixed numbers. Ask students to Think-Pair-Share what they think mixed number means. Allow a few students to share their thinking with the whole class.
2. Write $2\frac{1}{2}$ on the board and tell students that this is a mixed number. Use Calling Sticks to ask students what they notice. (It has a fraction, $\frac{1}{2}$, and a whole number, 2.)
3. Ask a few volunteers to come to the board to try and draw a model for $2\frac{1}{2}$.

TEACHER NOTE: At this point, it is ok for students to make an error. Analyzing and correcting misconceptions and errors is a critical part of math learning.

4. Ask students to discuss what they notice about the models on the board. If no student showed an accurate model for the mixed number, draw it now. Draw 2 circles on the board and shade them in. Then, draw a third circle and shade in $\frac{1}{2}$. Ask the following questions:

ASK

- *What do the 2 circles represent?*
  2 wholes
- *What does the shading in the third circle represent?*
  $\frac{1}{2}$
- *What do all 3 circles represent?*
  $2\frac{1}{2}$
- *Should the 2 whole circles also be divided into 2 equal pieces?*
  It is not necessary, but it may help us understand the denominator.
- *If we were to divide the 2 whole circles into fractional parts, what should they be?*
  Halves

5. Ask students to chorally count how many pieces or halves, are shaded in.
   Students should count 5.
6. Tell students the number of pieces is the numerator. The denominator has not changed and is still 2. This means that $\frac{5}{2}$ and $2\frac{1}{2}$ are equivalent and they are both represented by the same model. Review the meaning of equivalent as needed.
7. Direct students to Lesson 4 BUILD Mixed to Improper. Work with students to complete the problems. Be sure to show students how to draw models and how to use multiplication to convert mixed numbers to improper fractions (denominator x whole number + numerator; denominator stays the same).
8. When there are a few minutes left in BUILD, review the answers and add "Mixed Number" to the Fraction Anchor Chart with a definition and example.

CONNECT (7 min)

Food Fraction Fun

Direct students to Lesson 4 CONNECT Food Fraction Fun and ask them to answer the question.

Answer Key for Food Fraction Fun:

$\frac{3}{8}+\frac{3}{8}+\frac{3}{8}+\frac{3}{8}=\frac{12}{8}; 1\frac{4}{8}$ (or $1\frac{1}{2}$.)

WRAP-UP (3 min)

Let's Chat About Our Learning

Ask volunteers to share their work and reasoning for the CONNECT problem. Encourage students to ask questions to clear up misconceptions and errors.

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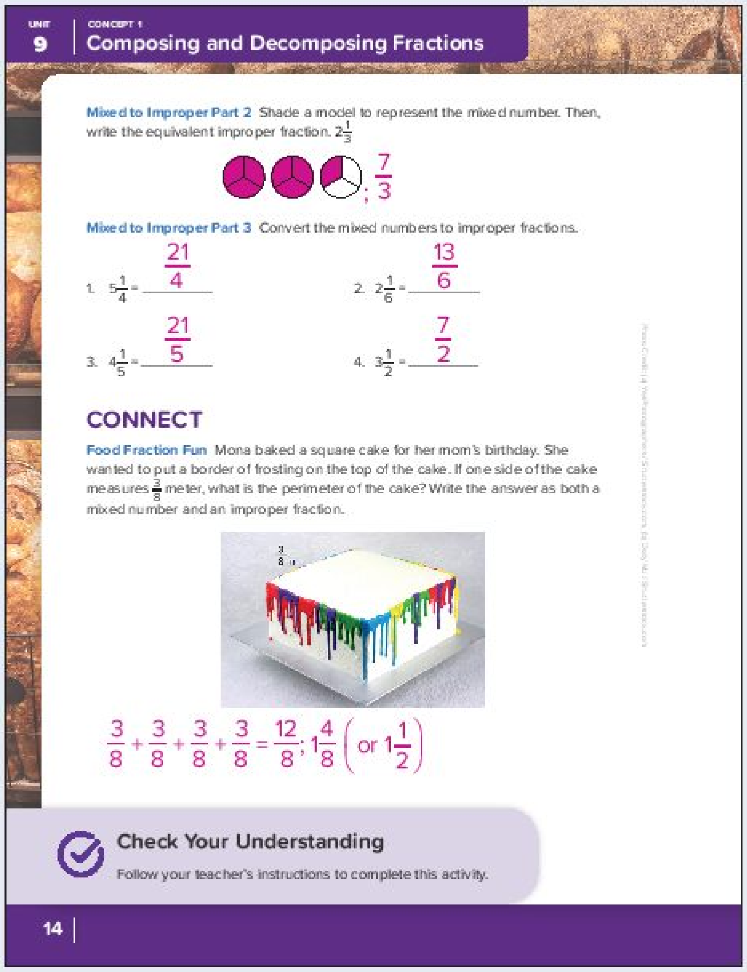
Student Page 14



UNIT 9 | CONCEPT 1
Composing and Decomposing Fractions

Mixed to Improper Part 2 Shade a model to represent the mixed number. Then, write the equivalent improper fraction. $2\frac{1}{3}$

$\frac{7}{3}$

Mixed to Improper Part 3 Convert the mixed numbers to improper fractions.

1. $5\frac{1}{4}=\frac{21}{4}$
2. $2\frac{1}{6}=\frac{13}{6}$
3. $4\frac{1}{5}=\frac{21}{5}$
4. $3\frac{1}{2}=\frac{7}{2}$

CONNECT

Food Fraction Fun Mona baked a square cake for her mom's birthday. She wanted to put a border of frosting on the top of the cake. If one side of the cake measures $\frac{3}{8}$ meter, what is the perimeter of the cake? Write the answer as both a mixed number and an improper fraction.

$\frac{3}{8}+\frac{3}{8}+\frac{3}{8}+\frac{3}{8}=\frac{12}{8}; 1\frac{4}{8}\left(\text{or } 1\frac{1}{2}\right)$

Check Your Understanding

Follow your teacher's instructions to complete this activity.

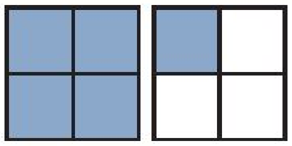
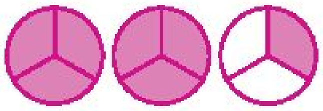
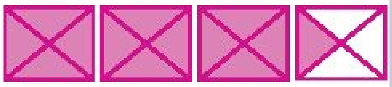
14

PRACTICE

Direct students to Lesson 4 PRACTICE and have them complete the problems. Address student errors and misconceptions around improper fractions.

Check Your Understanding

Models will vary. Accept as correct all models equal parts that match the denominator and shaded parts that match the numerator.

Model	Improper Fraction	Mixed Number
	$\frac{5}{4}$	$1\frac{1}{4}$
	$\frac{7}{3}$	$2\frac{1}{3}$
	$\frac{13}{4}$	$3\frac{1}{4}$
Create your own. Answers will vary	Answers will vary	Answers will vary

LESSON 5
Pieces from the Whole

Lesson Overview

In this lesson students review that $\frac{b}{b}$ is equal to 1 whole. They use models to add fractions and whole numbers and practice converting improper fractions into mixed numbers to simplify their answers. Students learn and practice several strategies to convert and simplify. Students then work on subtracting fractions from whole numbers by decomposing the whole. They begin with given models and are then asked to create their own to show understanding. Finally, students consider why the denominator stays the same when adding and subtracting fractions.

Lesson Essential Question

- How are fractions composed and decomposed?

Learning Objective

In this lesson

- Students will add and subtract fractions and whole numbers.

Grade-Level Standards

4.B.2.c Add and subtract fractions and whole numbers.

Vocabulary Check-In

Review concept vocabulary as needed.

Materials List

- No additional materials needed

DIGITAL

Lesson 5

Pieces from the Whole

Quick Code:
egmt4104

Photo Credit: Viktoria Hodos/ Shutterstock.com

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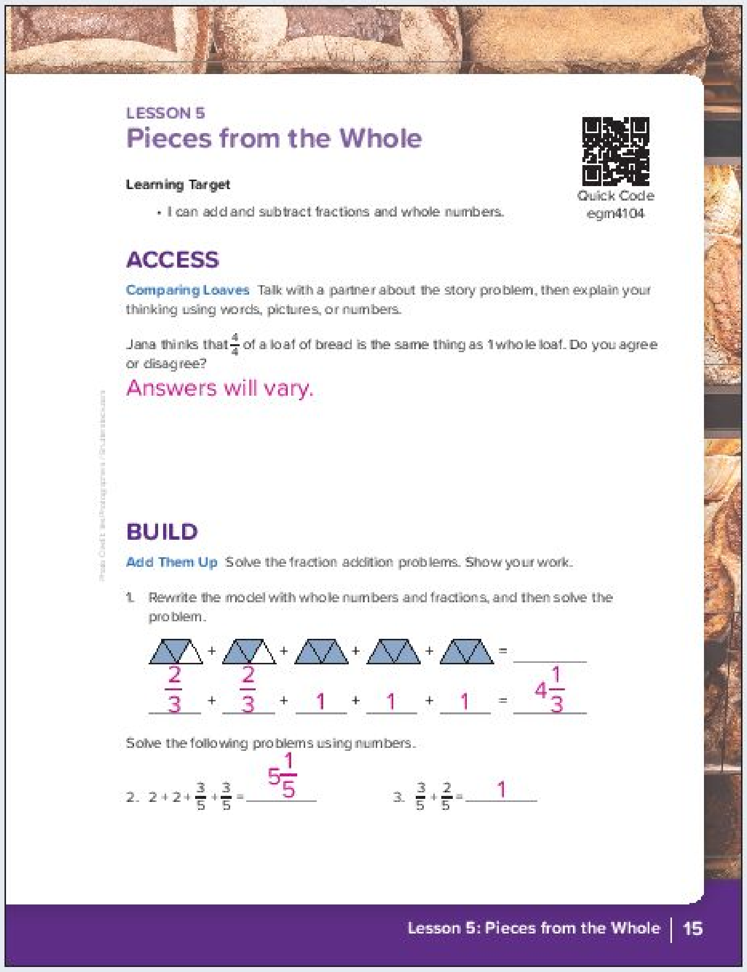
Student Page 15



LESSON 5

Pieces from the Whole

Learning Target

- I can add and subtract fractions and whole numbers.

Quick Code
egm4104

ACCESS

Comparing Loaves Talk with a partner about the story problem, then explain your thinking using words, pictures, or numbers.

Jana thinks that $\frac{4}{4}$ of a loaf of bread is the same thing as 1 whole loaf. Do you agree or disagree?

Answers will vary.

BUILD

Add Them Up Solve the fraction addition problems. Show your work.

1. Rewrite the model with whole numbers and fractions, and then solve the problem.

$\frac{2}{3} + \frac{2}{3} + 1 + 1 + 1 = 4\frac{1}{3}$

Solve the following problems using numbers.

2. $2 + 2 + \frac{3}{5} + \frac{3}{5} = 5\frac{1}{5}$

3. $\frac{3}{5} + \frac{2}{5} = 1$

Lesson 5: Pieces from the Whole | 15

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may struggle to understand and demonstrate that the proper fraction $\frac{b}{b}$ is the same as 1 whole.
- When adding and subtracting like fractions, students may add the numerators and the denominators instead of keeping the denominators the same.

Comparing Loaves

1. Direct students to Lesson 5 ACCESS Comparing Loaves and ask students to read the Learning Target aloud.
2. Have students talk with a partner to discuss the story problem in ACCESS and explain their thinking using words, pictures, or numbers.
3. After a few minutes, use Calling Sticks to hear responses from 2 to 3 students about their explanation.
4. Draw a model on the board, if needed, to help students see that $\frac{4}{4}$ is the same as 1 whole.

   TEACHER NOTE: This is a concept review that students will need to fully understand in order to subtract fractions from whole numbers. If students are struggling, take the time to draw additional models on the board for fractions such as $\frac{5}{5}$ or $\frac{12}{12}$ until students feel more confident.

BUILD (40 min)

Add Them Up (20 min)

1. Ask students to talk with a partner to review how they composed and decomposed fractions in previous lessons.
2. Tell students that today they will be working on adding and subtracting fractions and whole numbers. Explain that this is an extension of composing (adding) and decomposing (subtracting).

3. Ask students to try Problem 1 in Lesson 5 BUILD Add Them Up.
4. After a few minutes, use Calling Sticks to hear from 2 to 3 students about their answers and their strategies. Reinforce that there are 3 whole shapes colored in, $\frac{2}{3}$ of another shape and $\frac{2}{3}$ of another.

   TEACHER NOTE: Students may have many strategies to solve this problem. Some may see that they can regroup a part from one of the $\frac{2}{3}$ models to create a whole with the other $\frac{2}{3}$ model, thus making $1\frac{1}{3}$. Accept all reasonable solutions and allow students to explain their reasoning.
5. Write the equation, $\frac{2}{3} + \frac{2}{3} + 1 + 1 + 1 = 3\frac{4}{3}$, on the board. Ask students to talk with their Shoulder Partner about how this equation matches the model and what they notice about the fraction $\frac{4}{3}$. (It is improper.)
6. Ask a student volunteer to convert the improper fraction, $\frac{4}{3}$, into a mixed number.

   TEACHER NOTE: This is review from the previous lesson. Students should recognize that $\frac{4}{3}$ is equivalent to $1\frac{1}{3}$. If students are confused about conversion, make note so they can get additional support during Concept Check-In and Remediation, or at another time.
7. Explain that once $\frac{4}{3}$ is converted into the mixed number $1\frac{1}{3}$, we can now add the 1 whole to the 3 wholes to make $4\frac{1}{3}$.
8. Ask students to finish Lesson 5 BUILD Add Them Up either independently, with a partner, or as a class depending on their needs.
9. Use the last 5 minutes of the segment to go over answers together. Ask students to share their problem-solving strategies.

   TEACHER NOTE: Note how students are changing from improper to proper fractions. Do they wait until they have a complete answer and then convert, or do they notice when they have a whole and record it? In this example, the first student sees the whole $\frac{3}{3}$ and keeps it separate. The second student adds all the fractions and then converts to a mixed number: First Student: $\frac{2}{3}+\frac{1}{3}+\frac{1}{3}=\frac{3}{3}+\frac{1}{3}=1\frac{1}{3}$; Second Student: $\frac{2}{3}+\frac{1}{3}+\frac{1}{3}=\frac{4}{3}=1\frac{1}{3}$

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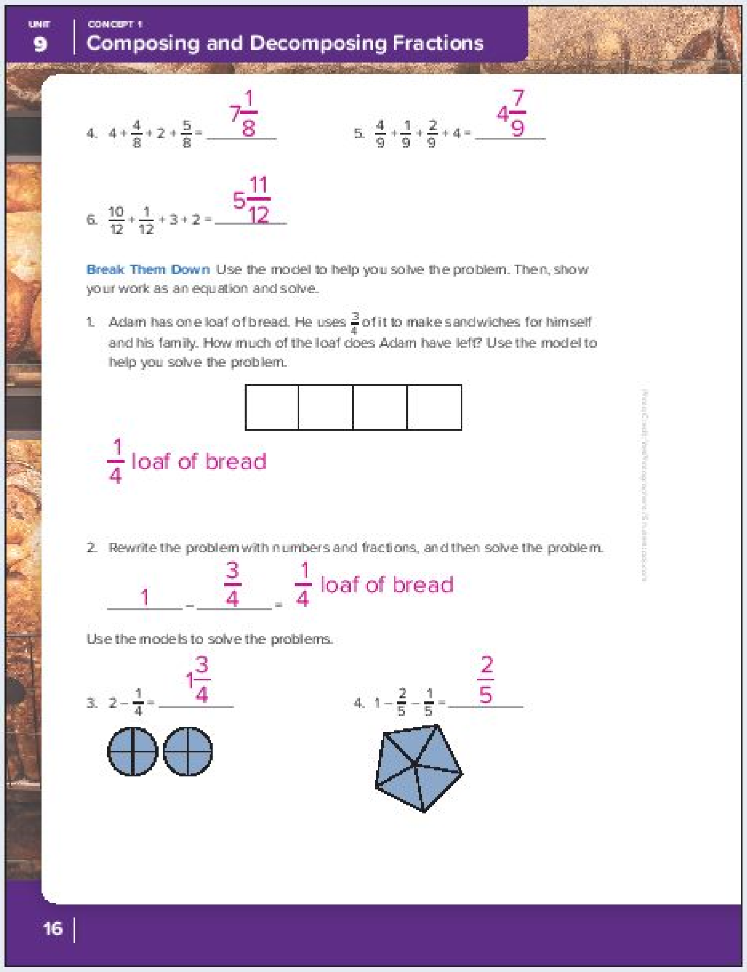
Student Page 16



UNIT 9 | CONCEPT 1
Composing and Decomposing Fractions

4. $4+\frac{4}{8}+2+\frac{5}{8}=$ $7\frac{1}{8}$

5. $\frac{4}{9}+\frac{1}{9}+\frac{2}{9}+4=$ $4\frac{7}{9}$

6. $\frac{10}{12}+\frac{1}{12}+3+2=$ $5\frac{11}{12}$

Break Them Down Use the model to help you solve the problem. Then, show your work as an equation and solve.

1. Adam has one loaf of bread. He uses $\frac{3}{4}$ of it to make sandwiches for himself and his family. How much of the loaf does Adam have left? Use the model to help you solve the problem.

   $\frac{1}{4}$ loaf of bread

2. Rewrite the problem with numbers and fractions, and then solve the problem.

   $1 - \frac{3}{4} = \frac{1}{4}$ loaf of bread

Use the models to solve the problems.

3. $2-\frac{1}{4}=$ $1\frac{3}{4}$

4. $1-\frac{2}{5}-\frac{1}{5}=$ $\frac{2}{5}$

16

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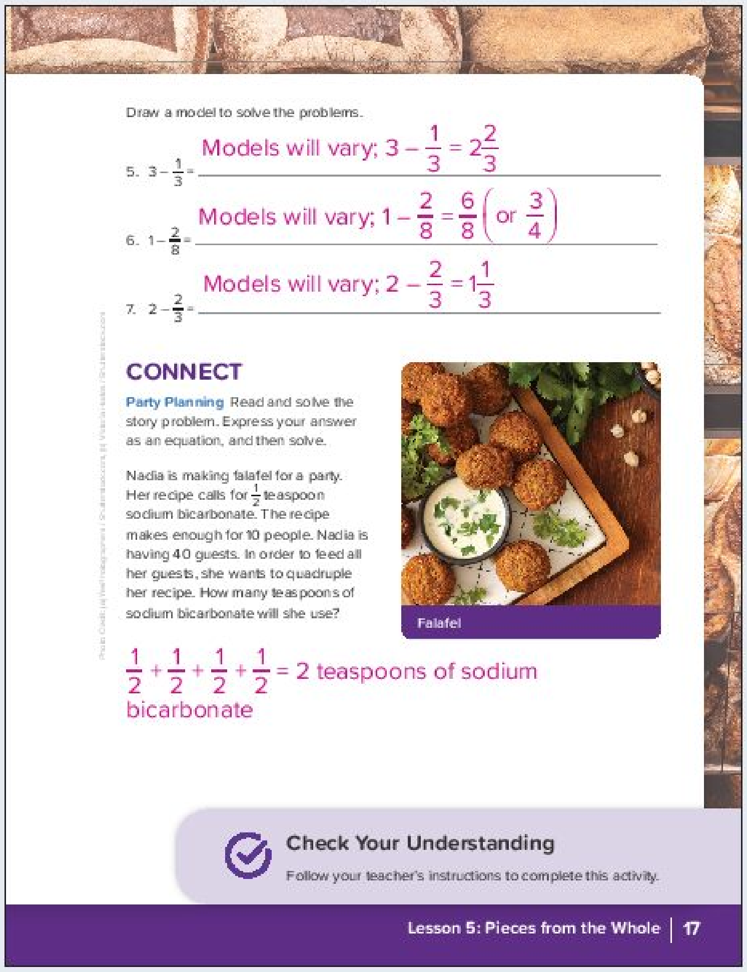
Student Page 17



Draw a model to solve the problems.

5. $3-\frac{1}{3}=$ Models will vary; $3-\frac{1}{3}=2\frac{2}{3}$

6. $1-\frac{2}{8}=$ Models will vary; $1-\frac{2}{8}=\frac{6}{8}\left(\text{or } \frac{3}{4}\right)$

7. $2-\frac{2}{3}=$ Models will vary; $2-\frac{2}{3}=1\frac{1}{3}$

CONNECT

Party Planning Read and solve the story problem. Express your answer as an equation, and then solve.

Nadia is making falafel for a party. Her recipe calls for $\frac{1}{2}$ teaspoon sodium bicarbonate. The recipe makes enough for 10 people. Nadia is having 40 guests. In order to feed all her guests, she wants to quadruple her recipe. How many teaspoons of sodium bicarbonate will she use?

Falafel

$\frac{1}{2}+\frac{1}{2}+\frac{1}{2}+\frac{1}{2}=$ 2 teaspoons of sodium bicarbonate

Check Your Understanding

Follow your teacher's instructions to complete this activity.

Lesson 5: Pieces from the Whole | 17

Break Them Down (20 min)

1. Ask students to turn to Lesson 5 BUILD Break Them Down and read and think about Problem 1.
2. After a few minutes, use Calling Sticks to hear responses from 2 to 3 students about how they can use the model to solve the story problem. Students should see that the loaf is divided into fourths. They can mark off $\frac{3}{4}$ of the model and see how much of the loaf is left.
3. Ask students how they could represent the whole loaf as a fraction reminding them of their work in Access.
4. Students should see that the whole loaf can also be written as $\frac{4}{4}$.
5. Ask students how subtracting a fraction from a whole number is different than adding a fraction to a whole number.

   TEACHER NOTE: Students should see that in order to subtract a fraction from a whole number we need to think of the whole as a fraction. In the example $1-\frac{3}{4}$. We need to think of 1 as $\frac{4}{4}$. This allows us to then subtract the $\frac{3}{4}$.
6. Direct students to finish Lesson 5 BUILD Break them Down either independently, with a partner, or as a class depending on the needs of your students.
7. Use the last 5 minutes of BUILD to review answers and have students share their strategies to solve them. Focus on the last three problems where students had to draw their own models.

   TEACHER NOTE: The ability for students to model with mathematics is one of the mathematical practice standards and is crucial for them to solve problems and explain their thinking to others.

CONNECT (7 min)

Party Planning

Direct students to Lesson 5 CONNECT Party Planning to answer the question. After a few minutes, use Calling Sticks to hear responses from 2 to 3 students about their explanation.

$\frac{1}{2}+\frac{1}{2}+\frac{1}{2}+\frac{1}{2}=$ 2 teaspoons of sodium bicarbonate

WRAP-UP (3 min)

Let's Chat About Our Learning

Ask students to explain why the denominator stays the same when adding fractions. Encourage students to use mathematical language to express their thinking.

TEACHER NOTE: Students should be able to explain that the denominator always stays the same because the size of the equal pieces does not change. This can be a tricky concept. If students are struggling, take the time to ask students to help you prove this with a model.

PRACTICE

Direct students to Lesson 5 PRACTICE and have them complete the problems. Address student errors and misconceptions around adding and subtracting fractions.

Check Your Understanding

Solve the problems. Show your work.

1. $\frac{3}{8}+\frac{2}{8}+\frac{7}{8}=\frac{12}{8}=1\frac{4}{8}$ (or $1\frac{1}{2}$)
2. $1-\frac{3}{6}-\frac{1}{6}=1-\frac{4}{6}=\frac{6}{6}-\frac{4}{6}=\frac{2}{6}$ (or $\frac{1}{3}$)
3. Omar and his friends are baking bread for their classmates and their families. Omar baked 1 loaf and Hady baked 1 loaf. If they each gave $\frac{1}{3}$ of their loaves to their families, how much bread did they have left for their class?

   $1-\frac{1}{3}=\frac{2}{3}$

   $\frac{2}{3}+\frac{2}{3}=\frac{4}{3}=1\frac{1}{3}$ loaves
4. Manar is sharing 2 packages of candy with her friends. She gave Maha $\frac{3}{8}$ of the package and Kamal $\frac{5}{8}$ of the package. How much candy does Manar have left?

   $\frac{3}{8}+\frac{5}{8}=\frac{8}{8}=1$

   2 – 1 = 1 package of candy

Materials List

- Crayons or colored pencils (2 different colors per student)

Photo Credit: Irina Burakova / Shutterstock.com

DIGITAL

Lesson 6

Adding Mixed Numbers

Quick Code:
egmt4105

LESSON 6
Adding Mixed Numbers

Lesson Overview

In this lesson, students apply their new learning in challenging ways. They solve bare mixed number addition problems and story problems and work to find a strategy that enables them to record their thinking. Students also play a game where they strategically think about where to place digits in a mixed number addition format in order to create the greatest number.

Lesson Essential Question

- How are fractions composed and decomposed?

Learning Objective

In this lesson

- Students will add mixed numbers with like denominators.

Grade-Level Standards

4.B.2.d Add and subtract mixed numbers with like denominators using equivalent fractions or properties of operations and the relationship between addition and subtraction.

Vocabulary Check-In

mixed numbers

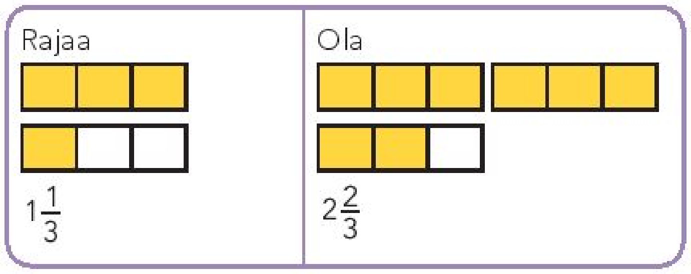
ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may struggle to convert their answers into a mixed number (for example, $3\frac{4}{3} = 4\frac{1}{3}$).
- Students may add or otherwise change the denominator when adding.

Collecting Pineapple Juice

1. Ask students to turn to Lesson 6 ACCESS Collecting Pineapple Juice and read the Learning Target. Ask students to briefly discuss how today's learning is connected to their learning in the previous lesson.
2. Have students talk with their Shoulder Partner to first discuss and then solve the story problem.
3. After a few minutes, use Calling Sticks to choose 2–3 students to model their problem-solving strategies on the board. Encourage students to ask each other questions.
4. Ensure a model like the one below is on the board:



5. Ask students how they would add these mixed numbers. (Some students may suggest adding the wholes then the fractions, while others may say the opposite. Either approach can yield the correct answer.) Ensure all students understand that we cannot leave $\frac{3}{3}$ as part of the answer because we know that is the same as another whole, so there are actually 4 liters of pineapple juice altogether.

Answer Key for Collecting Pineapple Juice:

Rajaa: $1 + \frac{1}{3} = 1\frac{1}{3}$ liters

Ola: $2 + \frac{2}{3} = 2\frac{2}{3}$

$1\frac{1}{3} + 2\frac{2}{3} = 3\frac{3}{3} = 4$ liters

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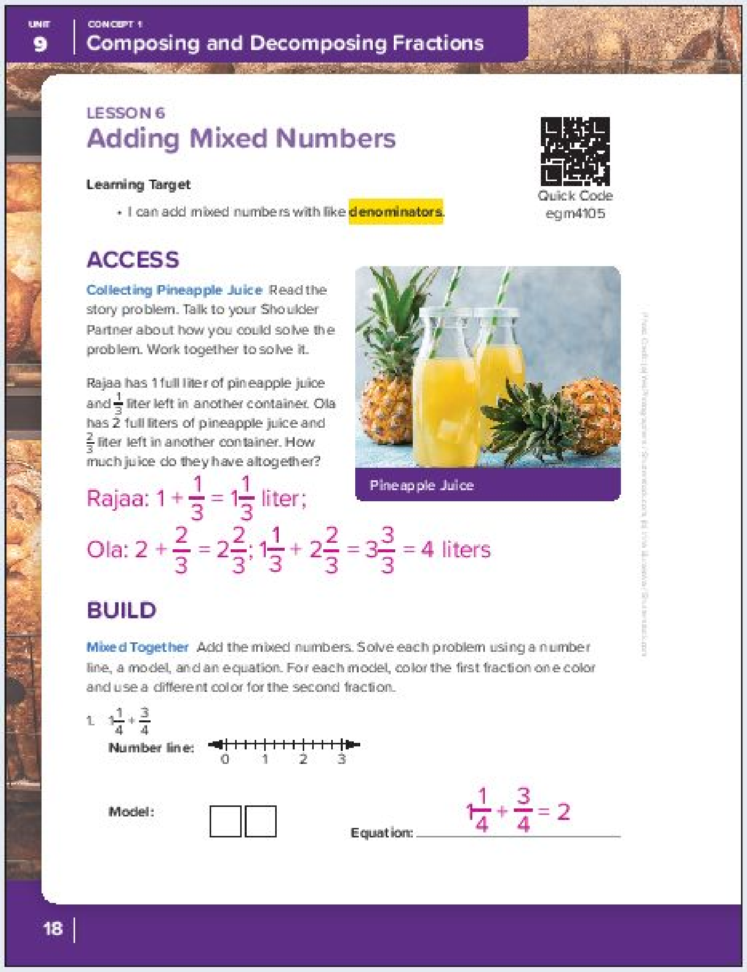
Student Page 18



UNIT 9 | CONCEPT 1
Composing and Decomposing Fractions

LESSON 6
Adding Mixed Numbers

Learning Target
- I can add mixed numbers with like denominators.

Quick Code
egm4105

ACCESS

Collecting Pineapple Juice Read the story problem. Talk to your Shoulder Partner about how you could solve the problem. Work together to solve it.

Rajaa has 1 full liter of pineapple juice and $\frac{1}{3}$ liter left in another container. Ola has 2 full liters of pineapple juice and $\frac{2}{3}$ liter left in another container. How much juice do they have altogether?

Pineapple Juice

Rajaa: $1 + \frac{1}{3} = 1\frac{1}{3}$ liter;

Ola: $2 + \frac{2}{3} = 2\frac{2}{3}$; $1\frac{1}{3} + 2\frac{2}{3} = 3\frac{3}{3} = 4$ liters

BUILD

Mixed Together Add the mixed numbers. Solve each problem using a number line, a model, and an equation. For each model, color the first fraction one color and use a different color for the second fraction.

1. $1\frac{1}{4} + \frac{3}{4}$

Number line: 0 1 2 3

Model:

Equation: $1\frac{1}{4} + \frac{3}{4} = 2$

18

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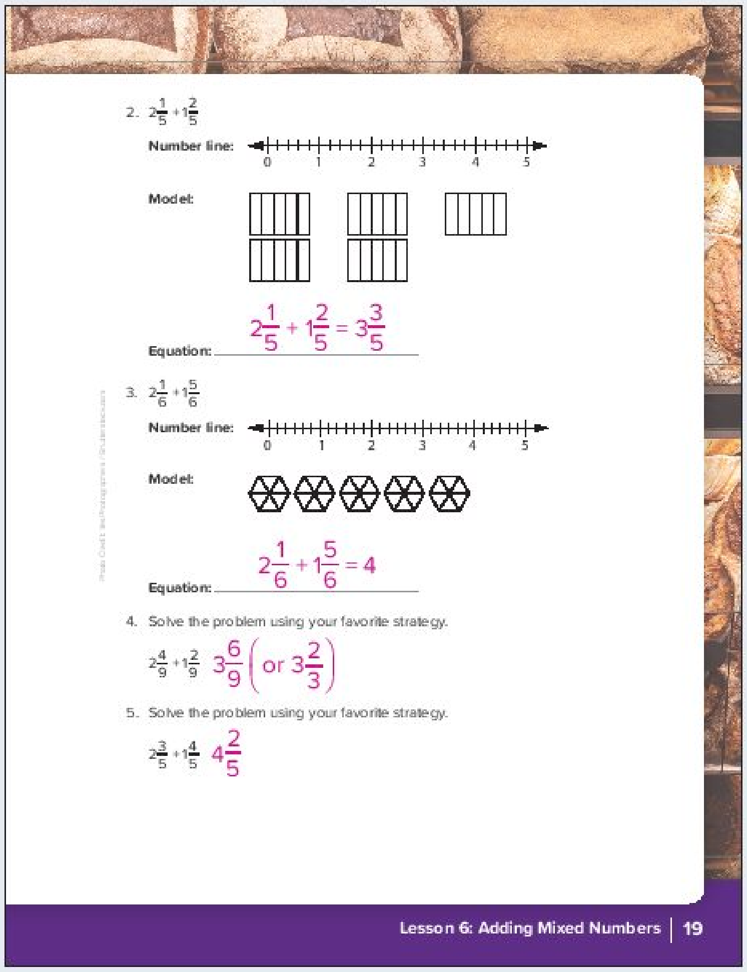
Student Page 19



2. $2\frac{1}{5} + 1\frac{2}{5}$

Number line:

Model:

Equation: $2\frac{1}{5} + 1\frac{2}{5} = 3\frac{3}{5}$

3. $2\frac{1}{6} + 1\frac{5}{6}$

Number line:

Model:

Equation: $2\frac{1}{6} + 1\frac{5}{6} = 4$

4. Solve the problem using your favorite strategy.

$2\frac{4}{9} + 1\frac{2}{9}$ $3\frac{6}{9}$ $\left(\text{or } 3\frac{2}{3}\right)$

5. Solve the problem using your favorite strategy.

$2\frac{3}{5} + 1\frac{4}{5}$ $4\frac{2}{5}$

Lesson 6: Adding Mixed Numbers | **19**

BUILD (40 min)

Mixed Together

1. Direct students to Lesson 6 BUILD Mixed Together and ask them to read Problem 1. Draw a number line on the board that matches the number line in the Student Materials.
2. Ask students how the number line is divided (fourths) and practice reading it together (for example, 0, $\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$, $\frac{4}{4}$ or 1, $1\frac{1}{4}$, $1\frac{2}{4}$, and so on).
3. Direct students to mark an X on $1\frac{1}{4}$ and then count up 3 more quarters $\left(\frac{1}{4}, \frac{2}{4}, \frac{3}{4}\right)$. Ask students to chorally respond with where they landed when they added $\frac{3}{4}$ to $1\frac{1}{4}$ (2).
4. Have students check their work by coloring in $1\frac{1}{4}$ of the rectangular model one color and $\frac{3}{4}$ a different color and then adding them together.
5. Ask students to talk with a partner about how they coulgd write an equation to show the same solution. $1\frac{1}{4} + \frac{3}{4} = 2$. Write the equation on the board so students may copy it, if needed.
6. Repeat the process with Problems 2 and 3. Answer any questions students may have about how to solve problems using number lines, picture models, or equations.
7. Ask students to complete Problems 4 and 5 on their own or with a partner. After about 5 minutes, ask volunteers to model their solutions on the board. Ask students to discuss which strategy they prefer and share their reasoning. If students are still struggling, work on more problems together until the end of BUILD.

TEACHER NOTE: If needed, briefly model how to draw a number line on the board: first draw the line, then label the whole numbers leaving spaces in between, then put hash marks between the whole numbers. The number of lines you draw should equal one less than the denominator. For example, if the denominator is 6 there will be 5 lines in between the whole numbers, so that there are 6 jumps between each whole number.

Answer Key for Mixed Together

1. $1\frac{1}{4}+\frac{3}{4}=2$
2. $2\frac{1}{5}+1\frac{2}{5}=3\frac{3}{5}$
3. $2\frac{1}{6}+1\frac{5}{6}=4$
4. $2\frac{4}{9}+1\frac{2}{9}=3\frac{6}{9}$ (or $3\frac{2}{3}$)
5. $2\frac{3}{5}+1\frac{4}{5}=4\frac{2}{5}$

CONNECT (7 min)

Create Your Own Problem

Ask students to turn to Lesson 6 CONNECT Create Your Own Problem and write their own mixed number addition story problem. They can use one of the equations provided or create their own. Students should then solve their problem and show their strategy.

TEACHER NOTE: Walk around the classroom while students are working and look for examples of student work to share with the class. Notice which strategies students use, and if they use the equation provided or create their own. Take note of which strategy is most commonly used by the students.

Answer Key for Create Your Own Problem:

Sample equation 1: $2\frac{2}{9}+3\frac{5}{9}=5\frac{7}{9}$

Sample equation 2: $1\frac{4}{5}+2\frac{1}{5}=4$

Sample equation 3: $3\frac{3}{10}+1\frac{9}{10}=4\frac{12}{10}=5\frac{2}{10}$

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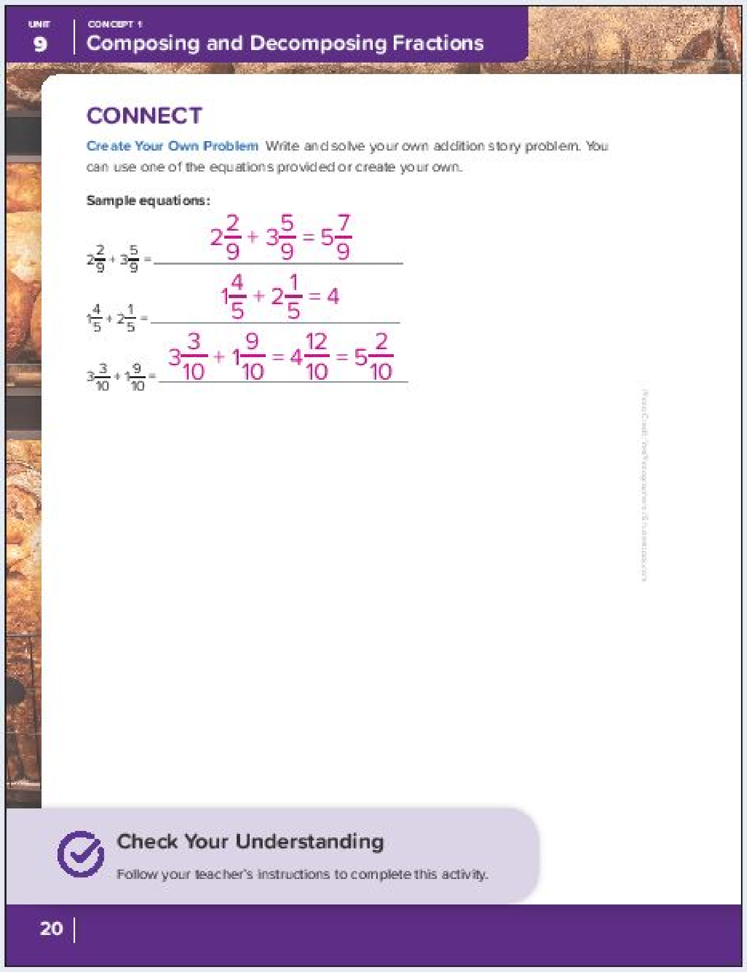
Student Page 20



UNIT 9 | CONCEPT 1 Composing and Decomposing Fractions

CONNECT

Create Your Own Problem Write and solve your own addition story problem. You can use one of the equations provided or create your own.

Sample equations:

$2\frac{2}{9}+3\frac{5}{9}=$ $2\frac{2}{9}+3\frac{5}{9}=5\frac{7}{9}$

$1\frac{4}{5}+2\frac{1}{5}=$ $1\frac{4}{5}+2\frac{1}{5}=4$

$3\frac{3}{10}+1\frac{9}{10}=$ $3\frac{3}{10}+1\frac{9}{10}=4\frac{12}{10}=5\frac{2}{10}$

Check Your Understanding

Follow your teacher's instructions to complete this activity.

20

WRAP-UP (3 min)

Let's Chat About Our Learning

Ask a volunteer to read their story problem aloud. Challenge students to solve their classmate's problem.

PRACTICE

Direct students to Lesson 6 PRACTICE and have them complete the problems. Address student errors and misconceptions around mixed number addition problems.

Check Your Understanding

Solve the problems using your favorite strategy. Show your work.

1. $4\frac{2}{5} + 2\frac{3}{5} = 6\frac{5}{5} = 7$
2. $3\frac{5}{12} + 1\frac{11}{12} = 4\frac{16}{12} = 5\frac{4}{12}$ (or $5\frac{1}{3}$)
3. A square measures $2\frac{1}{3}$ centimeters on one side. What is the perimeter of the square?
   $2\frac{1}{3} + 2\frac{1}{3} + 2\frac{1}{3} + 2\frac{1}{3} = 8\frac{4}{3} = 9\frac{1}{3}$ centimeters
4. At the market, I bought $3\frac{3}{8}$ kilograms of fruit and $4\frac{7}{8}$ kilograms of vegetables. What was the total mass, in kilograms, of the items I bought?
   $3\frac{3}{8} + 4\frac{7}{8} = 7\frac{10}{8} = 8\frac{2}{8}$ (or $8\frac{1}{4}$) kilograms

LESSON 7
Subtracting Mixed Numbers

Lesson Overview

In this lesson, students begin with an error analysis looking at a problem in which a student forgets to take the whole number out of the improper fraction when creating a mixed number. Students use models to practice subtracting mixed numbers in both bare number problems and story problems. At the end of the lesson, students consider why fractions are needed to solve problems in the real world.

Lesson Essential Questions

- How are fractions composed and decomposed?

Learning Objective

In this lesson

- Students will subtract mixed numbers with like denominators.

Grade-Level Standards

4.B.2.d Add and subtract mixed numbers with like denominators using equivalent fractions or properties of operations and the relationship between addition and subtraction.

Vocabulary Check-In

difference, minuend, mixed numbers, subtrahend

Materials List

- Crayons or colored pencils (1 per student)

Photo Credit: YesPhotographers / Shutterstock.com

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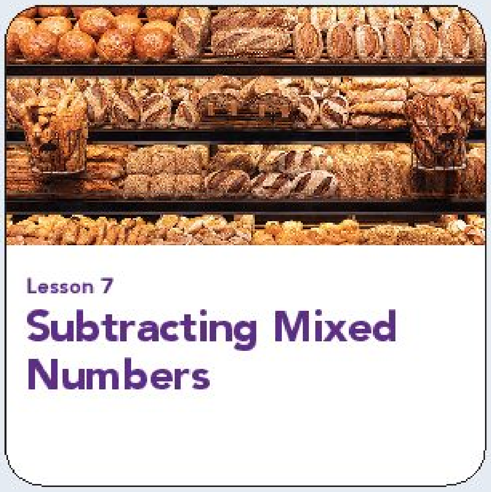

Lesson 7

Subtracting Mixed Numbers

Quick Code: egmt4106

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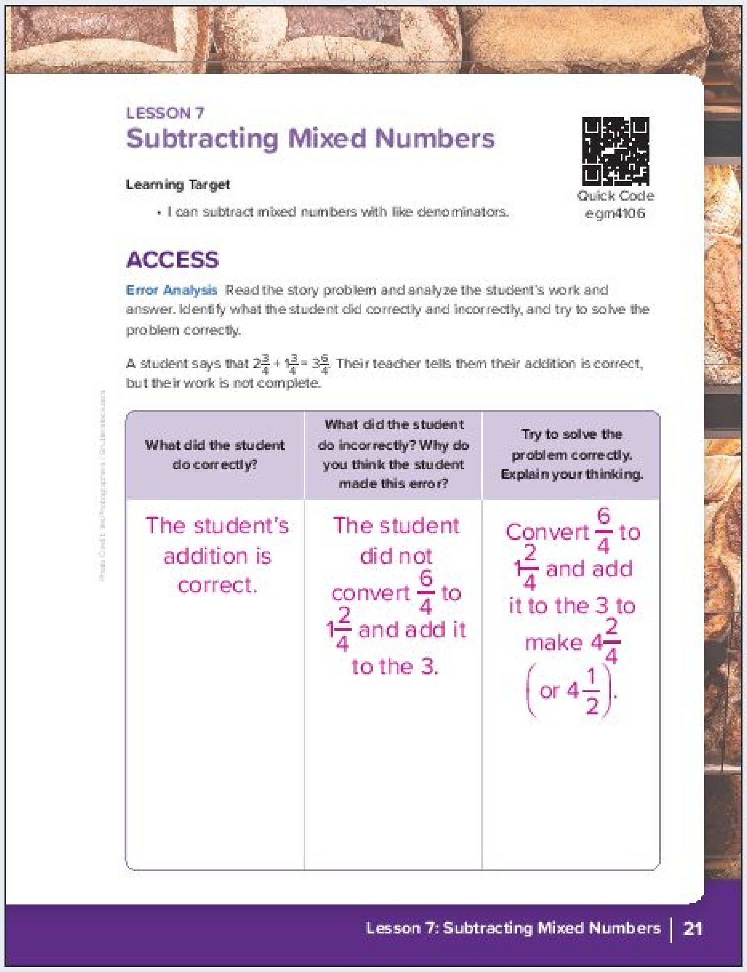
Student Page 21



LESSON 7

Subtracting Mixed Numbers

Quick Code
egm4106

Learning Target

- I can subtract mixed numbers with like denominators.

ACCESS

Error Analysis Read the story problem and analyze the student's work and answer. Identify what the student did correctly and incorrectly, and try to solve the problem correctly.

A student says that $2\frac{3}{4} + 1\frac{3}{4} = 3\frac{6}{4}$. Their teacher tells them their addition is correct, but their work is not complete.

What did the student do correctly?	What did the student do incorrectly? Why do you think the student made this error?	Try to solve the problem correctly. Explain your thinking.
The student's addition is correct.	The student did not convert $\frac{6}{4}$ to $1\frac{2}{4}$ and add it to the 3.	Convert $\frac{6}{4}$ to $1\frac{2}{4}$ and add it to the 3 to make $4\frac{2}{4}$ $\left(\text{or } 4\frac{1}{2}\right)$.

Lesson 7: Subtracting Mixed Numbers | 21

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students often struggle with regrouping mixed fractions when subtracting.

Error Analysis

Ask students to turn to Lesson 7 ACCESS Error Analysis and complete the error analysis. After a few minutes, use Calling Sticks to select students to share their solutions and reasoning.
The student needs to complete their work by converting $\frac{6}{4}$ to $1\frac{2}{4}$ and adding it to the 3 to make $4\frac{2}{4}$ (or $4\frac{1}{2}$).

BUILD (40 min)

Mixed Apart

1. Ask students to turn to Lesson 7 BUILD Mixed Apart.
2. Ask students the following questions, allowing them to build off each other's thinking:

ASK

- *How do you think subtracting mixed numbers will be similar to subtracting whole numbers?*
  We will subtract the subtrahend from the minuend and calculate the difference. We may have to regroup.
- *How do you think subtracting mixed numbers will be different from subtracting whole numbers?*
  We will have to subtract the whole numbers and the fractions since we will have both.
- *How do you think subtracting mixed numbers will be similar to adding mixed numbers?*
  We will have to look at the whole numbers and fractional numbers separately then put them back together.
- *How do you think subtracting mixed numbers will be different from adding mixed numbers?*
  We may have to decompose a whole number in order to have enough fractional parts. (This last part is very complex, so students may not fully understand this yet.)

TEACHER NOTE: The purpose of this math discussion is to help students connect the idea of regrouping during whole number subtraction to regrouping with mixed fractions. It also gives students a chance to review the steps they used to solve mixed number addition problems.

3. Ask students to look at Problem 1 in their Student Materials and raise their hand when they know how the number line is broken up. fourths

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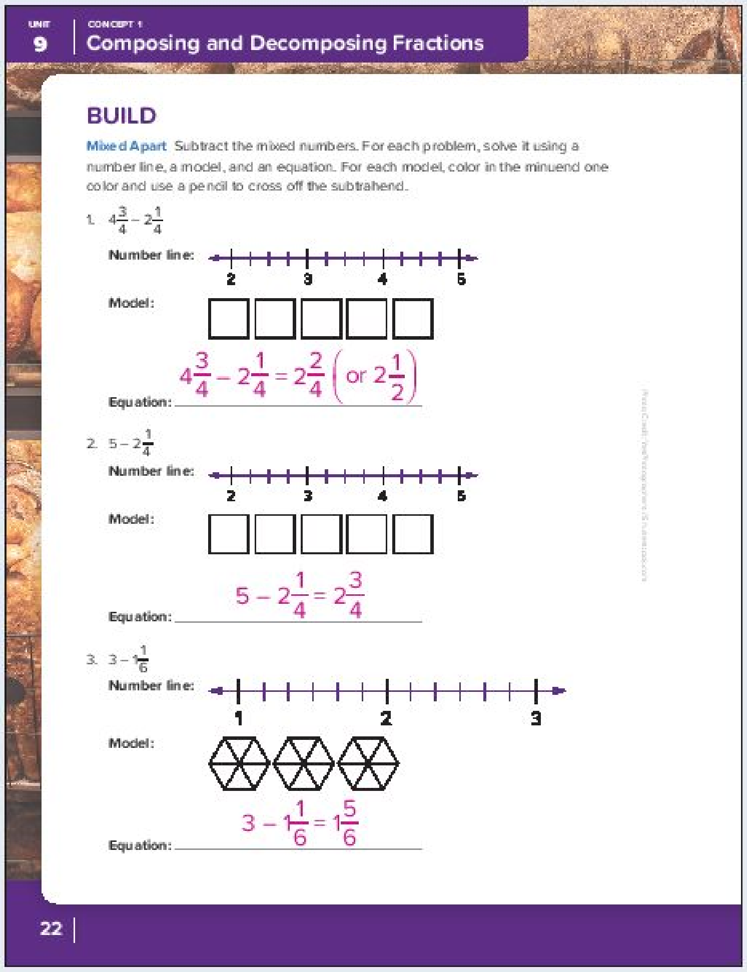
Student Page 22



UNIT 9 | CONCEPT 1 Composing and Decomposing Fractions

BUILD

Mixed Apart Subtract the mixed numbers. For each problem, solve it using a number line, a model, and an equation. For each model, color in the minuend one color and use a pencil to cross off the subtrahend.

1. $4\frac{3}{4} - 2\frac{1}{4}$

Number line:

Model:

Equation: $4\frac{3}{4} - 2\frac{1}{4} = 2\frac{2}{4} \left(\text{or } 2\frac{1}{2}\right)$

2. $5 - 2\frac{1}{4}$

Number line:

Model:

Equation: $5 - 2\frac{1}{4} = 2\frac{3}{4}$

3. $3 - 1\frac{1}{6}$

Number line:

Model:

Equation: $3 - 1\frac{1}{6} = 1\frac{5}{6}$

22

4. With students, start at the 5 and count backwards (for example, 5, $4\frac{3}{4}$, $4\frac{2}{4}$, $4\frac{1}{4}$, 3, and so on). Label each mark on the number line.

5. Ask students to mark an X on $4\frac{3}{4}$ since this is the minuend, the first and largest number in the subtraction problem.

6. Ask students to talk to their Shoulder Partner about how they could use the number line to count back $2\frac{1}{4}$. Ask volunteers to share their thinking with the class.
   Students should know that jumping back 4 small lines is the same as jumping back one whole since the line is divided into fourths and $\frac{4}{4} = 1$.

7. Ask students to use the number line to solve the problem and give a Thumbs-Up when they are finished. Discuss the correct answer.

8. Next, ask students how they can use the model to solve the problem.
   They can color in $4\frac{3}{4}$ of the rectangles and then cross off $2\frac{1}{4}$ of the colored sections.

9. Ask students to write an equation to represent the problem.

   TEACHER NOTE: Students may be able to see that they can subtract the whole numbers ($4 - 2 = 2$) and then the fractions $\left(\frac{3}{4} - \frac{1}{4} = \frac{2}{4}\right)$ with ease. However, several upcoming problems require students to regroup or decompose a whole number into an equivalent mixed number. You may want to model this as well. For example, Problem 2 requires students to decompose 5 to $4\frac{4}{4}$ first, before they can then subtract the whole numbers ($4 - 2 = 2$) and the fractions $\left(\frac{4}{4} - \frac{1}{4} = \frac{3}{4}\right)$ to get $2\frac{3}{4}$. Alternatively, some students may convert all mixed numbers to improper fractions and then subtract. All strategies are acceptable even if some are more efficient than others.

10. Review all strategies and answers as a class and clear up any misconceptions. Work with students to complete Problems 2–4, having students model their solutions for each.

11. Ask students to complete Problems 5–7 independently, with a partner, or in a small group, depending on their needs.

12. Use the last 5 minutes to go over the answers to Problems 5–7, having students share the strategies they found most effective, and discussing any problems they struggled with.

CONNECT (7 min)

Writing About Math

Ask students to turn to Lesson 7 CONNECT Writing About Math and respond to the questions.
Answers will vary. Accept all reasonable answers.

WRAP-UP (3 min)

Let's Chat About Our Learning

Ask volunteers to share their responses to the Writing About Math questions. Encourage students to ask each other questions to clarify their thinking.

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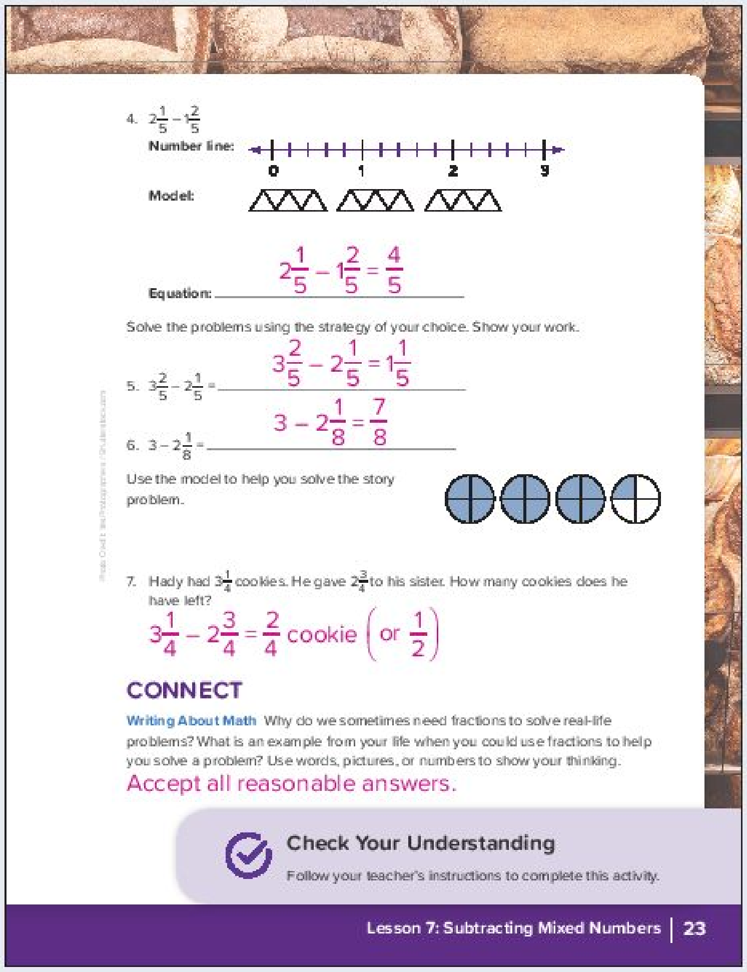
Student Page 23



4. $2\frac{1}{5} - 1\frac{2}{5}$

Number line:

Model:

Equation: $2\frac{1}{5} - 1\frac{2}{5} = \frac{4}{5}$

Solve the problems using the strategy of your choice. Show your work.

5. $3\frac{2}{5} - 2\frac{1}{5} =$ $3\frac{2}{5} - 2\frac{1}{5} = 1\frac{1}{5}$

6. $3 - 2\frac{1}{8} =$ $3 - 2\frac{1}{8} = \frac{7}{8}$

Use the model to help you solve the story problem.

7. Hady had $3\frac{1}{4}$ cookies. He gave $2\frac{3}{4}$ to his sister. How many cookies does he have left?

$3\frac{1}{4} - 2\frac{3}{4} = \frac{2}{4}$ cookie $\left(\text{or } \frac{1}{2}\right)$

CONNECT

Writing About Math Why do we sometimes need fractions to solve real-life problems? What is an example from your life when you could use fractions to help you solve a problem? Use words, pictures, or numbers to show your thinking.

Accept all reasonable answers.

Check Your Understanding

Follow your teacher's instructions to complete this activity.

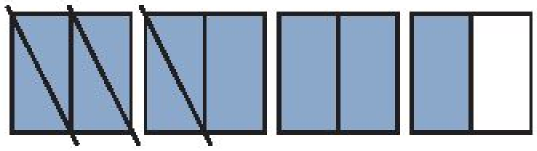
Lesson 7: Subtracting Mixed Numbers | 23

PRACTICE

Direct students to Lesson 7 PRACTICE and have them complete the problems. Address student errors and misconceptions around subtracting mixed numbers.

Check Your Understanding

1. Write and solve a subtraction equation for the model.



$3\frac{1}{2} - 1\frac{1}{2} = 2$

2. $4\frac{3}{10} - 3\frac{2}{10} = 1\frac{1}{10}$

3. $2\frac{4}{5} - 1\frac{3}{5} = 1\frac{1}{5}$

4. Gamal has $3\frac{1}{2}$ grapefruits. For breakfast on Monday, he eats $\frac{1}{2}$ a grapefruit. On Tuesday, he eats $1\frac{1}{2}$ grapefruits. How many grapefruits does he have left?

   $3\frac{1}{2} - \frac{1}{2} = 3; 3 - 1\frac{1}{2} = 2\frac{2}{2} - 1\frac{1}{2} = 1\frac{1}{2}$ grapefruits

Concept Check-In and Remediation

Lesson Overview

In this lesson, students work to correct misconceptions and errors from Concept 1 Composing and Decomposing Fractions. First, administer the Concept Check-In. Once you have reviewed the quiz results, choose remediation activities based on the needs of your students. Some recommendations are listed in the chart, but the needs of your particular students should inform your choices. Students may work independently, in pairs, or in a small group with the teacher.

Lesson Essential Question

- How are fractions composed and decomposed?

Learning Objective

In this lesson

- Students will correct misconceptions and errors related to composing and decomposing proper fractions, improper fractions, and mixed numbers.

Grade-Level Standards

4.B.2 Build fractions from unit fractions.

4.B.2.a Demonstrate understanding of fraction $\frac{a}{b}$ with $a > 1$ as a sum of fractions $\frac{1}{b}$.

i. Explain addition and subtraction of fractions as joining and separating parts referring to the same whole.

ii. Decompose a fraction into a sum of fractions with the same denominator in more than one way.

4.B.2.c Add and subtract fractions and whole numbers.

4.B.2.d Add and subtract mixed numbers with like denominators using equivalent fractions or properties of operations and the relationship between addition and subtraction.

Vocabulary Check-In

Review concept vocabulary as needed.

Materials List

- Materials may vary

DIGITAL

Concept Check-In and Remediation

Quick Code:
egmt4107

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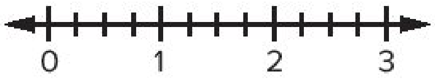
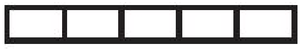
COMMON MISCONCEPTIONS AND ERRORS

- Students may believe that composing fractions is limited to adding up to a whole and not be able to compose fractions less than or greater than one whole.
- Students often think fractions must be less than 1. When confronted with an improper fraction, some students may not recognize it as a fraction.
- Students may not recognize that an improper fraction requires more than one whole that is the same size, same shape, and divided into the same number of parts.
- Students may struggle to understand and demonstrate that the proper fraction $\frac{b}{b}$ is the same as 1 whole.
- When adding and subtracting like fractions, students may add the numerators and the denominators instead of keeping the denominators the same.
- Students may struggle to convert their answers into a mixed number (for example, $3\frac{4}{3} = 4\frac{1}{3}$).
- Students often struggle with regrouping mixed fractions when subtracting.

Remediation: Correcting Misconceptions

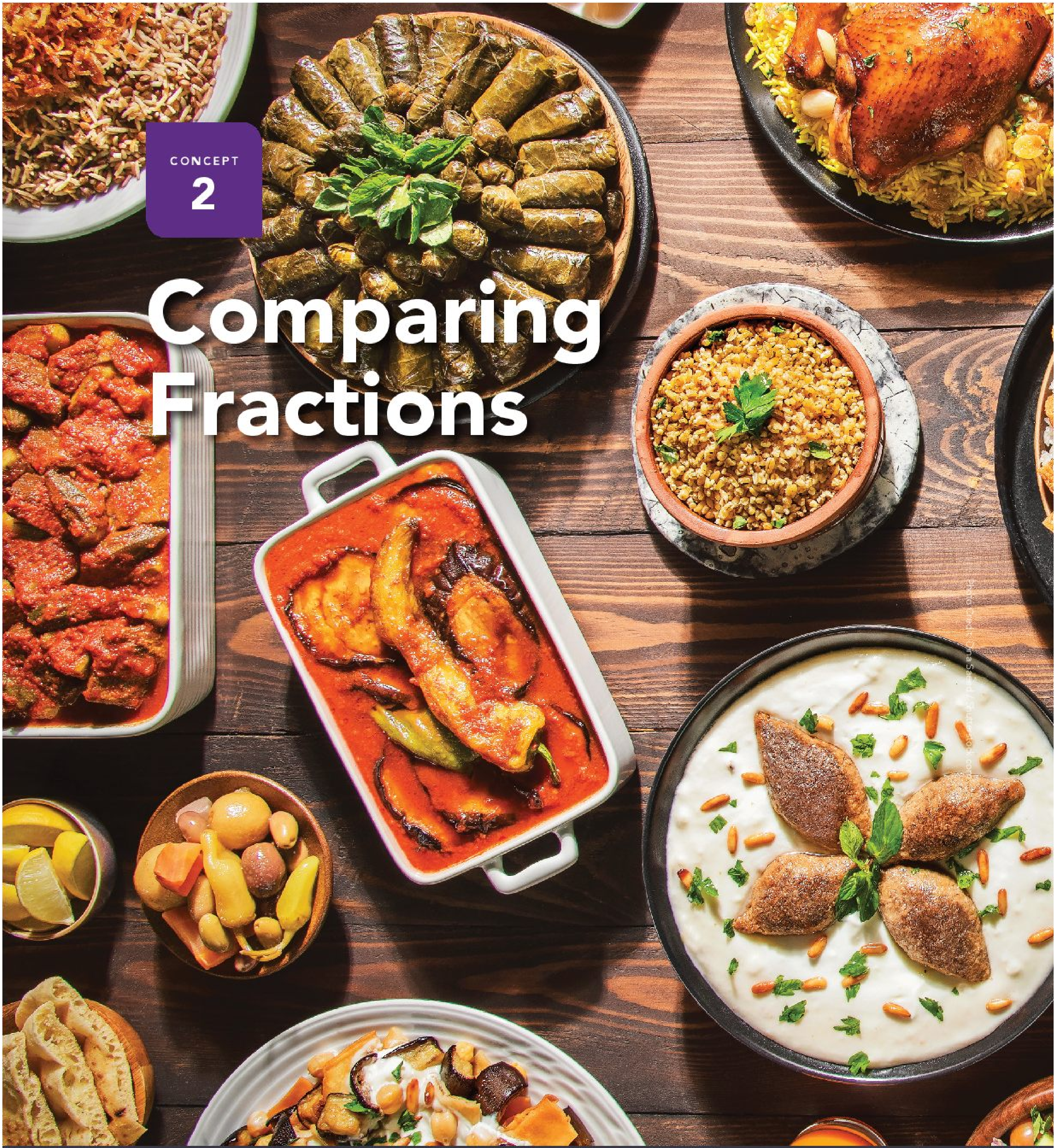
If . . . Students partition a whole into shares that are unequal (for example, the student identifies a fourth as one of four parts, rather than one of four equal parts).	**Then . . .** Review Lesson 1 and discuss similar real-world story problems about whole items broken into equal parts. Students could also practice folding pieces of paper into halves to see two equal parts that make $\frac{1}{2}$ and then folding their halves again to see that four equal parts make $\frac{1}{4}$.
If . . . Students struggle to understand that a fraction is composed of individual unit fractions added together.	**Then . . .** Review Lesson 1. Give students similar problems to practice breaking into unit fractions and writing equations to make a whole.
If . . . Students are unable to compose from or decompose into non-unit fractions in many different ways .	**Then . . .** Review Many Ways to Break It Down from Lesson 3. Give students additional fractions and ask them to practice decomposing them in as many ways as possible with and without unit fractions.
If . . . Students struggle to work with improper fractions or recognize them as fractions.	**Then . . .** Review Lesson 4 Mixed to Improper as a guideline. Give students mixed numbers with whole numbers greater than 1 and ask them to draw a model to represent the number. Students could also practice counting on a number line like the one below by starting at 0, $\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{2}{4}$, etc. 

If . . .	**Then . . .**
Students struggle to demonstrate that the proper fraction $\frac{b}{b}$ is the same as 1 whole or add denominators.	Review Comparing Loaves from Lesson 5. Give students models divided into different fractions to practice writing different models as 1 whole and in their fraction form. Such as:  1 whole or $\frac{5}{5}$ Review Add Them Up from Lesson 5 and give students additional practice with similar problems. Students should be reminded that the denominator tells you how many equal pieces make one unit and if you add the denominators the new denominator won't describe how many equal pieces are in one unit.
If . . . Students cannot convert their answers into a mixed number (for example, $3\frac{4}{3}=4\frac{1}{3}$).	**Then . . .** Review Lesson 6 so students have a visual model of how and why to change improper fractions into proper mixed numbers.
If . . . Students are unable to regroup mixed fractions when subtracting.	**Then . . .** Review Lesson 7. Give students problems that require regrouping and help them use models to show their work.

CONCEPT

2

Comparing Fractions



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Concept Overview

In Concept 2: Comparing Fractions, students extend their understanding of fraction equivalence and ordering, initially comparing and ordering fractions with like denominators and numerators. This is extended to improper fractions and mixed numbers before moving into identifying and creating equivalent fractions. Next, students explore benchmark fractions (0, $\frac{1}{2}$, 1). They create equivalent fractions to match benchmarks, comparing fractions using the benchmarks in bare number and story problems. They also demonstrate an understanding that fraction comparisons are valid only if the two fractions refer to the same whole.

Concept Standards

4.B.1 Extend understanding of fraction equivalence and ordering.

4.B.1.a Explain cases of fraction equivalency by using visual fraction models.

4.B.1.b Explain how the number and size of the parts of equivalent fractions differ even though the two fractions themselves are the same size.

4.B.1.c Identify and generate equivalent fractions.

4.B.1.d Compare two fractions using different strategies (for example, by comparing two fractions with different numerators and different denominators by creating like denominator or numerators or comparing to a benchmark fraction).

4.B.1.e Demonstrate understanding that fraction comparisons are valid only when the two fractions refer to the same whole.

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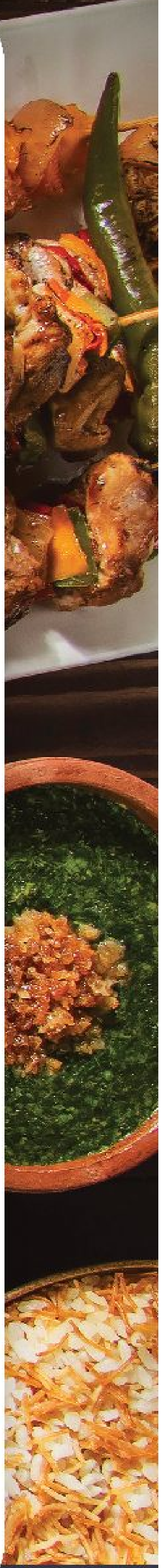
Concept Planner

All lessons are designed to be 60 minutes. The materials listed in this chart are items to gather for each group. Items for the class or for individual students are indicated as needed.

Lesson Name	Materials for Lesson	Vocabulary Terms	Learning Objectives	
8 Like Denominators and Numerators	• No additional materials needed	Like denominator Denominator Numerator Order	• Students will compare and order fractions with like denominators. • Students will compare and order fractions with like numerators.	
9 Glass $\frac{1}{2}$ Full or $\frac{2}{4}$ Empty?	• Fraction Anchor Chart	Equivalence	• Students will use visual models to identify equivalent fractions.	
10 Same Fraction, Different Day	• Large copy of the fraction wall (See the Unit 9 Lesson 10 Fraction Wall at the end of this volume.) • Students' domino sets from Unit 9 Lesson 2	Equivalent	• Students will use visual models and multiples to generate equivalent fractions. • Students will explain what makes two fractions equivalent.	

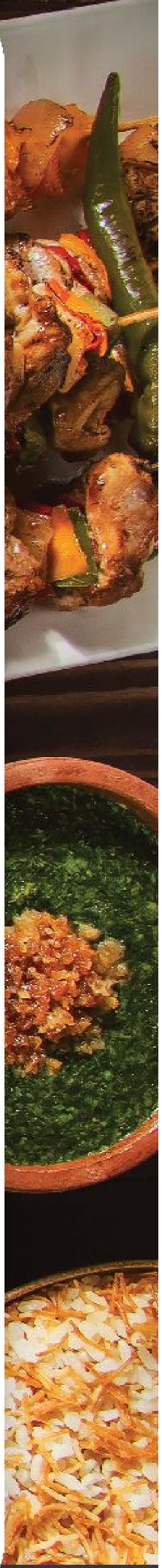


	Common Misconceptions and Errors	Opportunities for Formative Assessment
	• Students may not understand that when comparing fractions with like denominators, the fraction with the larger numerator is greater. • Students may not understand that when comparing fractions with like numerators, the fraction with the smaller denominator is greater.	Fractional Candy Bars, Comparing Fractions with Like Denominators, Comparing Fractions with Like Numerators, Top Heavy, Practice, Check Your Understanding
	• Students may believe that one half of a circle is the same as a one-half of a square, mistakenly thinking the size of the whole does not matter. • Students may think that if the denominators are different, the fractions cannot be equivalent.	Who Ate More?, What Is Equivalent?, Pizza Contest, Practice, Check Your Understanding
	• Students sometimes think that if the denominators are different, the fractions cannot be equal.	Equal Sets, Fraction Wall, Recipe Trouble, Practice, Check Your Understanding

Lesson Name	Materials for Lesson	Vocabulary Terms	Learning Objectives	
11 Benchmark Fractions	• Fraction Anchor Chart • Unit 9 Lesson 11 Mixed Up Fraction Cards (Photocopy 1 set per pair of students. See Blackline Master at the end of this volume.)	Benchmark fraction Equivalency	• Students will identify benchmark fractions. • Students will generate fractions equivalent to benchmark fractions.	
12 Half or Whole?	• Paper clip for Spin to Win • Pencil for Spin to Win	Compare Equivalent Benchmark	• Students will compare fractions to a benchmark fraction.	
Concept Check-In and Remediation	• Materials may vary	Review concept vocabulary as needed.	• Students will work to correct misconceptions and errors related to comparing fractions.	

Opportunities for Assessment:

In addition to the assessment opportunities included in this chart, each concept will include a Concept Check-In.



	Common Misconceptions and Errors	**Opportunities for Formative Assessment**
	• Students often believe that the larger the denominator the closer to a benchmark of 1 (for example, they may think $\frac{1}{4}$ is closer to 1 than $\frac{1}{2}$ because 4 is greater than 2).	Walking Down the Path, Continuing Down the Path, Writing About Math, Practice, Check Your Understanding
	• Students may not be able to find equivalent fractions for benchmarks, so comparing a fraction to a benchmark may be difficult. • Students may be confused that even though whole numbers increase in size as we count ($1 < 2 < 3 < 4$), fractions do not increase in size when the denominator does ($\frac{1}{1} > \frac{1}{2} > \frac{1}{3} > \frac{1}{4}$).	Error Analysis, Use a Benchmark, Writing About Math, Practice, Check Your Understanding
	• Students may not understand that when comparing fractions with like denominators, the fraction with the larger numerator is greater. • Students may not understand that when comparing fractions with like numerators, the fraction with the smaller denominator is greater. • Students may forget that the size of the whole matters when comparing fractions. • Students may think that if the denominators are different, the fractions cannot be equivalent. • Students often believe that the larger the denominator the closer to a benchmark of 1 (for example, they may think $\frac{1}{4}$ is closer to 1 than $\frac{1}{2}$ because 4 is greater than 2). • Students may be confused that even though whole numbers increase in size as we count ($1 < 2 < 3 < 4$), fractions do not increase in size when the denominator does ($\frac{1}{1} > \frac{1}{2} > \frac{1}{3} > \frac{1}{4}$). • Students may not be able to find equivalent fractions for benchmarks, so comparing a fraction to a benchmark may be difficult.	

LESSON 8
Like Denominators and Numerators

Lesson Overview

In this lesson, students compare and order fractions with like denominators and numerators. They use models to help compare fractions with like denominators and numerators and use this knowledge to compose their own rules about comparing and ordering fractions. For practice, students extend this knowledge to story problems.

Lesson Essential Question

- What patterns can I observe when comparing fractions with like denominators or numerators?

Learning Objectives

In this lesson

- Students will compare and order fractions with like denominators.
- Students will compare and order fractions with like numerators.

Grade-Level Standard

4.B.1.d Compare two fractions using different strategies (for example, by comparing two fractions with different numerators and different denominators by creating like denominators or numerators or comparing to a benchmark fraction).

Vocabulary Check-In

like denominator, denominator, numerator, order

Materials List

- No additional materials needed

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DIGITAL

Lesson 8
Like Denominators and Numerators

Quick Code:
egmt4108

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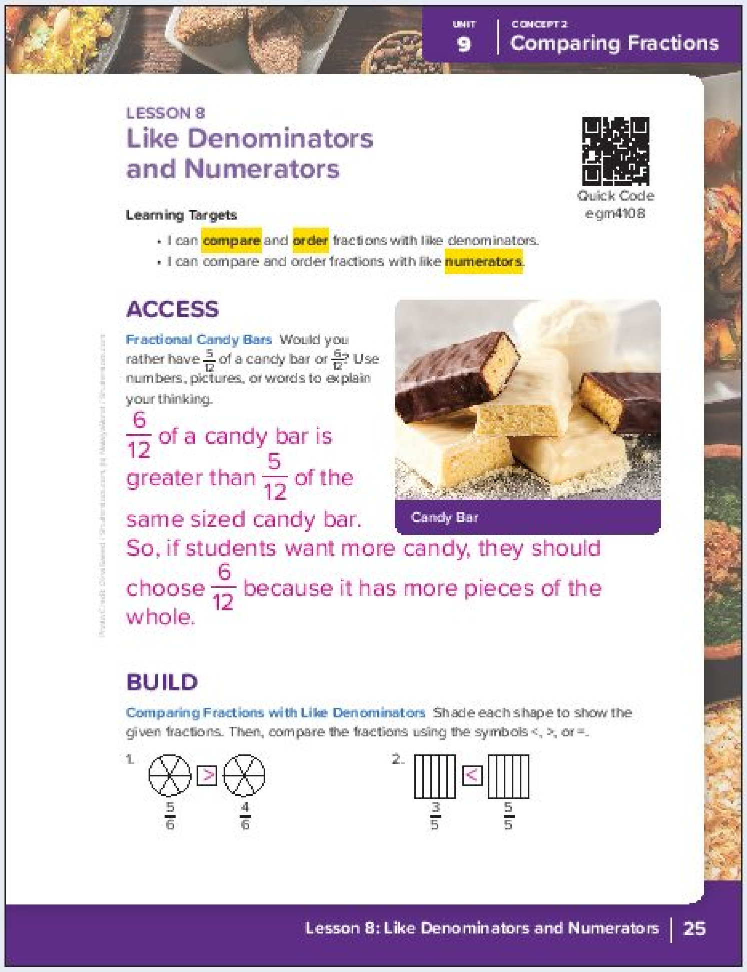
Student Page 25



UNIT 9 | CONCEPT 2 Comparing Fractions

LESSON 8

Like Denominators and Numerators

Quick Code egm4108

Learning Targets

- I can compare and order fractions with like denominators.
- I can compare and order fractions with like numerators.

ACCESS

Fractional Candy Bars Would you rather have $\frac{5}{12}$ of a candy bar or $\frac{6}{12}$? Use numbers, pictures, or words to explain your thinking.

Candy Bar

$\frac{6}{12}$ of a candy bar is greater than $\frac{5}{12}$ of the same sized candy bar. So, if students want more candy, they should choose $\frac{6}{12}$ because it has more pieces of the whole.

BUILD

Comparing Fractions with Like Denominators Shade each shape to show the given fractions. Then, compare the fractions using the symbols <, >, or =.

1. $\frac{5}{6}$ > $\frac{4}{6}$

2. $\frac{3}{5}$ < $\frac{5}{5}$

Lesson 8: Like Denominators and Numerators | 25

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

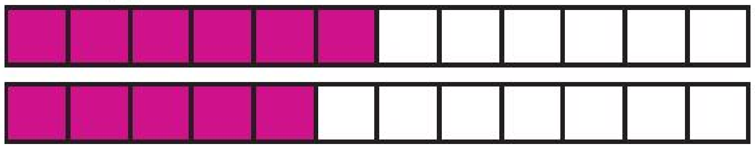
- Students may not understand that when comparing fractions with like denominators, the fraction with the larger numerator is greater
- Students may not understand that when comparing fractions with like numerators, the fraction with the smaller denominator is greater.

Fractional Candy Bars

1. Direct students to Lesson 8 ACCESS Fractional Candy Bars and chorally read the Learning Targets. Ask students to briefly explain what they think the Learning Targets mean.
2. Ask students to discuss the story problem in ACCESS with a partner.
3. After a few minutes, use Calling Sticks to choose 2–3 students to share their thinking.
4. Draw a model on the board to help students compare the two fractions, if needed. Explain that, because the two fractions have like denominators—the same denominators—it is easy to compare the two quantities. Explain to students that when comparing fractions, it is important to confirm that the wholes are the same.

Answer Key for Fractional Candy Bars:

$\frac{6}{12}$ of a candy bar is greater than $\frac{5}{12}$ of the same sized candy bar. So if students want more candy, they should choose $\frac{6}{12}$ because it has more pieces of the whole.



BUILD (40 min)

Comparing Fractions with Like Denominators (20 min)

1. Direct students to Lesson 8 BUILD Comparing Fractions with Like Denominators.
2. Ask students to work with a partner to solve Problems 1–3. Encourage students to think about a rule that explains how to compare fractions with like denominators without using a model.
3. After a few minutes, go over the answers to Problems 1–3. Then, ask students to work with their partner to fill in the blanks in Problem 4 to write a rule for comparing fractions with like denominators without a model.
4. After a minute, call on several to share their thinking. Students should see that when comparing fractions with like denominators, the one with the larger numerator is always the greater fraction. Remind students that it is important to confirm that the wholes are the same.
5. Ask students to discuss how their strategies might change when comparing fractions with like numerators.
6. Using this knowledge, ask students to complete Problem 5.
7. Call on several students to share their answers.

Comparing Fractions with Like Numerators (20 min)

1. Direct students to Lesson 8 BUILD Comparing Fractions with Like Numerators. Ask students to work with a partner to solve Problems 1–3.
2. After a few minutes, go over the answers together. Then ask students to complete Problem 4 to write a rule statement similar to the one they wrote for like denominators.

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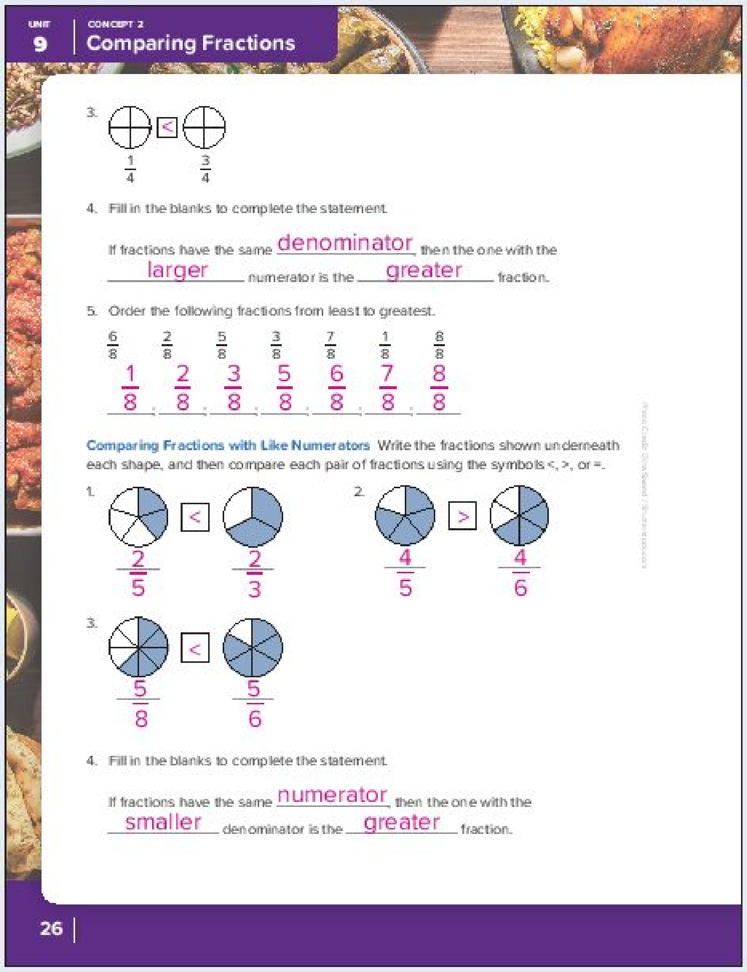
Student Page 26



UNIT 9 | CONCEPT 2
Comparing Fractions

3. $\frac{1}{4}$ < $\frac{3}{4}$

4. Fill in the blanks to complete the statement.

If fractions have the same denominator, then the one with the larger numerator is the greater fraction.

5. Order the following fractions from least to greatest.

$\frac{6}{8}$ $\frac{2}{8}$ $\frac{5}{8}$ $\frac{3}{8}$ $\frac{7}{8}$ $\frac{1}{8}$ $\frac{8}{8}$

$\frac{1}{8}$, $\frac{2}{8}$, $\frac{3}{8}$, $\frac{5}{8}$, $\frac{6}{8}$, $\frac{7}{8}$, $\frac{8}{8}$

Comparing Fractions with Like Numerators Write the fractions shown underneath each shape, and then compare each pair of fractions using the symbols <, >, or =.

1. $\frac{2}{5}$ < $\frac{2}{3}$

2. $\frac{4}{5}$ > $\frac{4}{6}$

3. $\frac{5}{8}$ < $\frac{5}{6}$

4. Fill in the blanks to complete the statement.

If fractions have the same numerator, then the one with the smaller denominator is the greater fraction.

26

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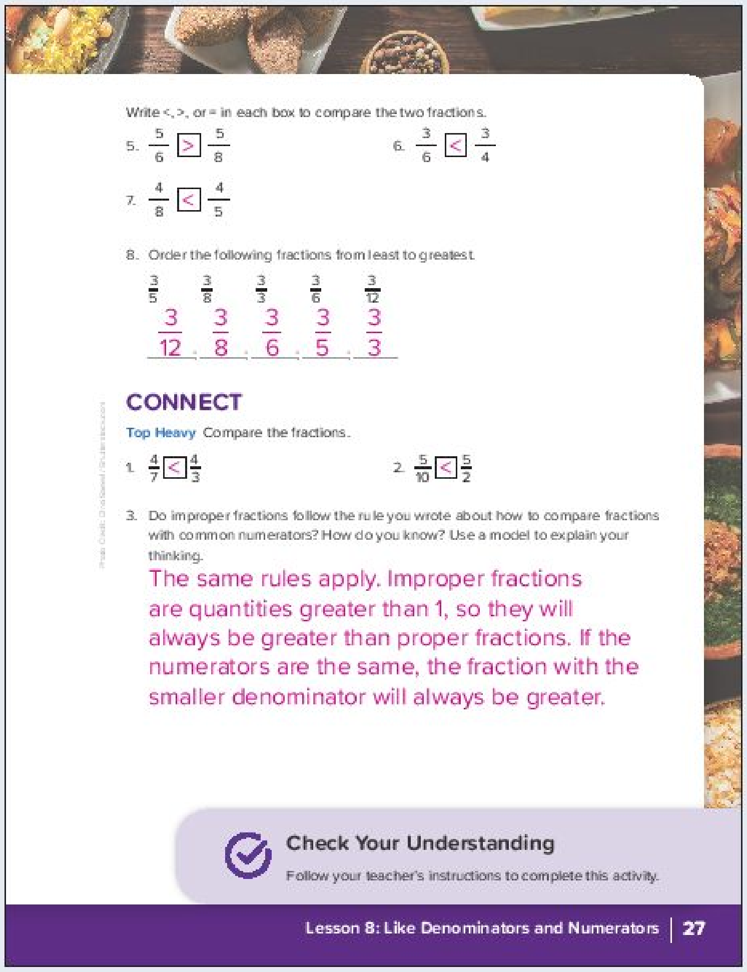
Student Page 27



Write <, >, or = in each box to compare the two fractions.

5. $\frac{5}{6} \boxed{>} \frac{5}{8}$
6. $\frac{3}{6} \boxed{<} \frac{3}{4}$
7. $\frac{4}{8} \boxed{<} \frac{4}{5}$
8. Order the following fractions from least to greatest.

$\frac{3}{5}$ $\frac{3}{8}$ $\frac{3}{3}$ $\frac{3}{6}$ $\frac{3}{12}$

$\frac{3}{12}$, $\frac{3}{8}$, $\frac{3}{6}$, $\frac{3}{5}$, $\frac{3}{3}$

CONNECT

Top Heavy Compare the fractions.

1. $\frac{4}{7} \boxed{<} \frac{4}{3}$
2. $\frac{5}{10} \boxed{<} \frac{5}{2}$
3. Do improper fractions follow the rule you wrote about how to compare fractions with common numerators? How do you know? Use a model to explain your thinking.

The same rules apply. Improper fractions are quantities greater than 1, so they will always be greater than proper fractions. If the numerators are the same, the fraction with the smaller denominator will always be greater.

Check Your Understanding

Follow your teacher's instructions to complete this activity.

Lesson 8: Like Denominators and Numerators | 27

3. After a minute, call on several students to share their thinking.
   Students should see that when comparing fractions with like numerators, the one with the smaller denominator is always the greater fraction. Once again, remind students that it is important to confirm that the wholes are the same.
4. Using this knowledge, ask students to complete Problems 5–8.

CONNECT (7 min)

Top Heavy

Ask students to turn to Lesson 8 CONNECT Top Heavy to solve the problems and respond to the question.

Answer Key for Top Heavy:

1. $\frac{4}{7} < \frac{4}{3}$
2. $\frac{5}{10} < \frac{5}{2}$
3. The same rules apply. Improper fractions are quantities greater than 1, so they will always be greater than proper fractions. If the numerators are the same, the fraction with the smaller denominator will always be greater. Some students may convert to mixed numbers and then compare.

WRAP-UP (3 min)

Let's Chat About Our Learning

Ask students to share their responses to Lesson 8 CONNECT Top Heavy.

PRACTICE

Direct students to Lesson 8 PRACTICE and have them complete the problems. Address student errors and misconceptions around comparing and ordering fractions.

Check Your Understanding

Compare the following fractions using greater than (>) or less than (<), and then order them from least to greatest.

1. $\frac{1}{9} < \frac{9}{9}$; $\frac{4}{9} < \frac{8}{9}$; $\frac{6}{9} > \frac{5}{9}$

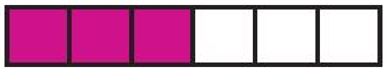
   $\frac{1}{9}, \frac{4}{9}, \frac{5}{9}, \frac{6}{9}, \frac{8}{9}, \frac{9}{9}$

2. $\frac{5}{15} < \frac{5}{8}$; $\frac{5}{5} > \frac{5}{10}$; $\frac{5}{9} > \frac{5}{12}$

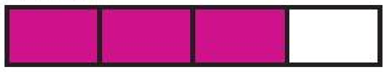
   $\frac{5}{15}, \frac{5}{12}, \frac{5}{10}, \frac{5}{9}, \frac{5}{8}, \frac{5}{5}$

3. Jana ate $\frac{3}{6}$ of her kofta kebab. Lamiaa ate $\frac{3}{4}$ of her kofta kebab. If their kebabs are the same size, who ate more? Use a model to explain your thinking. Lamiaa ate more because $\frac{3}{4}$ is greater than $\frac{3}{6}$.

Jana



Lamiaa



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LESSON 9

Glass $\frac{1}{2}$ Full or $\frac{2}{4}$ Empty?

Lesson Overview

In this lesson, students revisit the concept of equivalent fractions using visual models, which was introduced in Primary 3. They identify equivalent fractions and discuss how the numerators and denominators may differ even though the fractions are equivalent. They extend this understanding to explore mixed numbers and discuss the importance of the size of the whole when determining equivalency.

Lesson Essential Question

- What strategies can I use to find equivalent fractions?

Learning Objective

In this lesson

- Students will use visual models to identify equivalent fractions.

Grade-Level Standards

4.B.1 Extend understanding of fraction equivalence and ordering.

4.B.1.a Explain cases of fraction equivalency by using visual fraction models

4.B.1.b Explain how the number and size of the parts of equivalent fractions differ even though the two fractions themselves are the same size.

4.B.1.e Demonstrate understanding that fraction comparisons are valid only when the two fractions refer to the same whole.

Vocabulary Check-In

equivalence

Materials List

- Fraction Anchor Chart

DIGITAL

Lesson 9

Glass $\frac{1}{2}$ Full or $\frac{2}{4}$ Empty?

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Photo Credit: Sliv_Leo / Shutterstock.com

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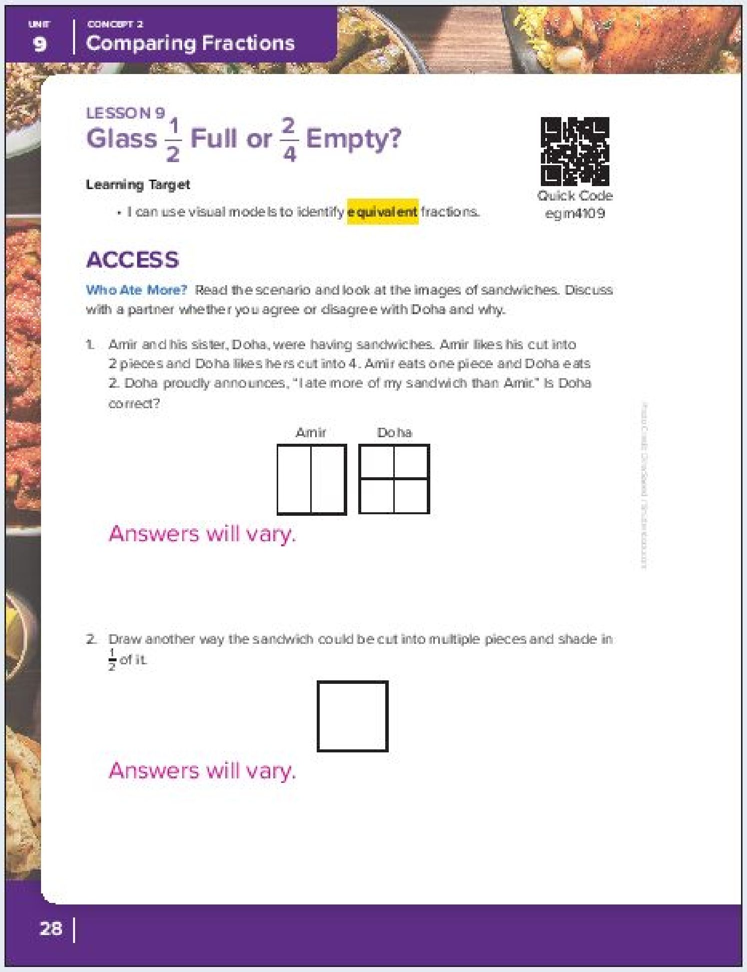
Student Page 28



UNIT 9 | CONCEPT 2 Comparing Fractions

LESSON 9

Glass $\frac{1}{2}$ Full or $\frac{2}{4}$ Empty?

Learning Target

- I can use visual models to identify **equivalent** fractions.

Quick Code egm4109

ACCESS

Who Ate More? Read the scenario and look at the images of sandwiches. Discuss with a partner whether you agree or disagree with Doha and why.

1. Amir and his sister, Doha, were having sandwiches. Amir likes his cut into 2 pieces and Doha likes hers cut into 4. Amir eats one piece and Doha eats 2. Doha proudly announces, "I ate more of my sandwich than Amir." Is Doha correct?

Answers will vary.

2. Draw another way the sandwich could be cut into multiple pieces and shade in $\frac{1}{2}$ of it.

Answers will vary.

28

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may believe that one-half of a circle is the same as a one-half of a square, mistakenly thinking the size of the whole does not matter.
- Students may think that if the denominators are different, the fractions cannot be equivalent.

Who Ate More?

1. Direct students to Lesson 9 ACCESS Who Ate More? and chorally read the Learning Targets.
2. Ask students to read the sandwich problem and talk to their Shoulder Partner about Doha's statement. Ask students to give you a Thumbs-Up when they are ready to share with the class.
3. Discuss the problem with the class, asking questions to make sure students understand the concept. Both Amir and Doha ate $\frac{1}{2}$ of their sandwich.
4. Direct students to use the blank sandwich image to draw another way to cut the sandwich into equal pieces and then shade in half. Ask students to share their work with their Shoulder Partner.
5. Use Calling Sticks to choose 2–3 students to share their sandwich images on the board.

BUILD (40 min)

What Is Equivalent?

1. Write the word *equivalent* on the board and ask students to think about the definition and how it relates to fractions and the ACCESS problem. Ask volunteers to share their ideas.
2. Discuss students' ideas and work with them to come up with a definition of *equivalent*, such as "two numbers or quantities that are the same."
3. Add the term *equivalent fraction* to the Fraction Anchor Chart with an example of the sandwiches $\frac{1}{2} = \frac{2}{4}$ and a more detailed definition such as, "Equivalent fractions have different numerators and denominators but are equal to the same value. For example, $\frac{1}{2}$ and $\frac{2}{4}$ both are equal to $\frac{1}{2}$ and represent the same quantity of an equal whole."

   TEACHER NOTE: It is important for students to understand that for two fractions to be equivalent the whole needs to be the same. This will be explored in greater depth in CONNECT.

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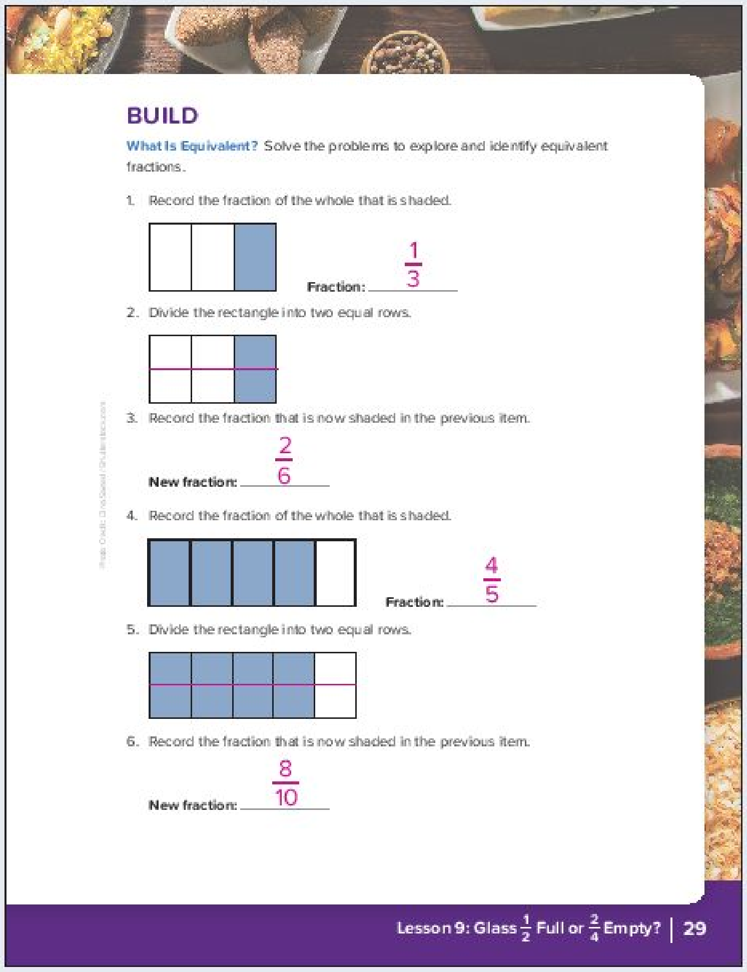

BUILD

What Is Equivalent? Solve the problems to explore and identify equivalent fractions.

1. Record the fraction of the whole that is shaded.

   Fraction: $\frac{1}{3}$

2. Divide the rectangle into two equal rows.
3. Record the fraction that is now shaded in the previous item.

   New fraction: $\frac{2}{6}$

4. Record the fraction of the whole that is shaded.

   Fraction: $\frac{4}{5}$

5. Divide the rectangle into two equal rows.
6. Record the fraction that is now shaded in the previous item.

   New fraction: $\frac{8}{10}$

Lesson 9: Glass $\frac{1}{2}$ Full or $\frac{2}{4}$ Empty? | 29

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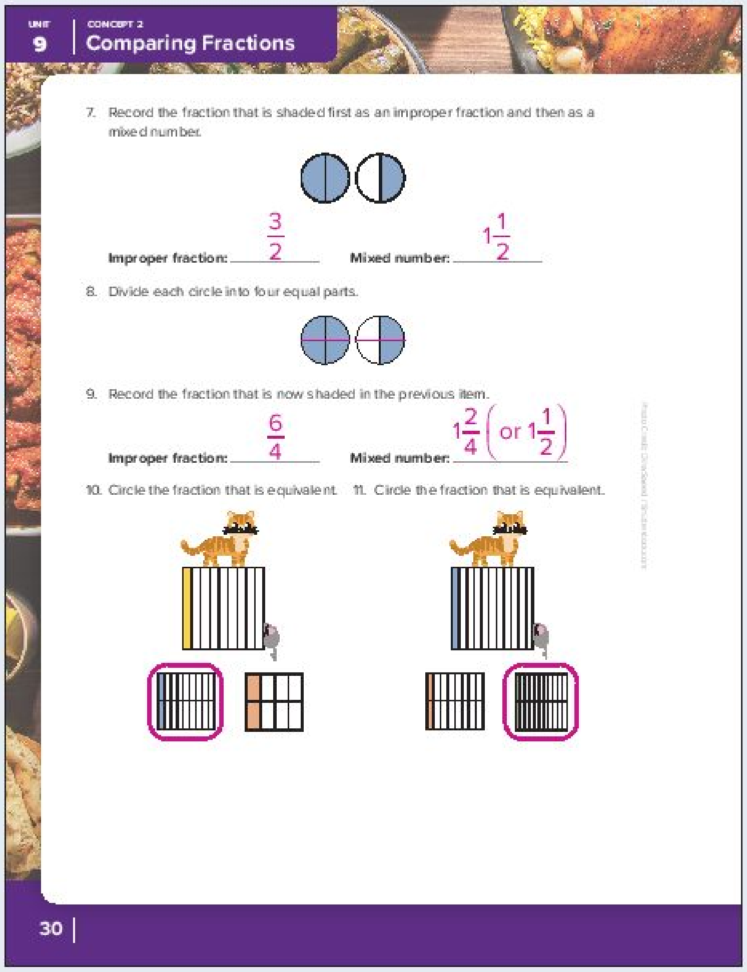
Student Page 30



UNIT 9 | CONCEPT 2 Comparing Fractions

7. Record the fraction that is shaded first as an improper fraction and then as a mixed number.

Improper fraction: $\frac{3}{2}$ **Mixed number:** $1\frac{1}{2}$

8. Divide each circle into four equal parts.

9. Record the fraction that is now shaded in the previous item.

Improper fraction: $\frac{6}{4}$ **Mixed number:** $1\frac{2}{4}\left(\text{or } 1\frac{1}{2}\right)$

10. Circle the fraction that is equivalent.

11. Circle the fraction that is equivalent.

30

4. Remind students that they worked with fractions and mixed numbers in previous lessons. They compared fractions with like denominators and numerators and ordered them. In today's lesson they will identify fractions that are equivalent or have the same value.

5. Ask students to turn to Lesson 9 BUILD What Is Equivalent? and work with a partner to solve Problem 1. Discuss the answer with students and ask students to work with their partner to solve Problems 2 and 3 and give you a Thumbs-Up when they are ready to share.

6. Ask students to discuss the following questions:

ASK

- *Is the same amount of the whole shaded?* Yes
- *What do you notice about the denominator and the numerator? How did they both change?* They both doubled.
- *Is $\frac{1}{3}$ equivalent to $\frac{2}{6}$? Do both models represent the same quantity?* Yes

7. Emphasize that the denominator doubled so there are more pieces, but the numerator also doubled, so the same amount is shaded. The denominators are different and there are more pieces in the whole, but if the same quantity of the whole is represented, the fractions are equivalent.
8. Repeat the process with Problems 4–6.
9. Ask students to discuss whether there can be equivalent fractions for mixed numbers or improper fractions. Ask students to work with their partner to solve Problems 7–9. Discuss the answers and ask students to share their problem-solving strategies and reasoning.

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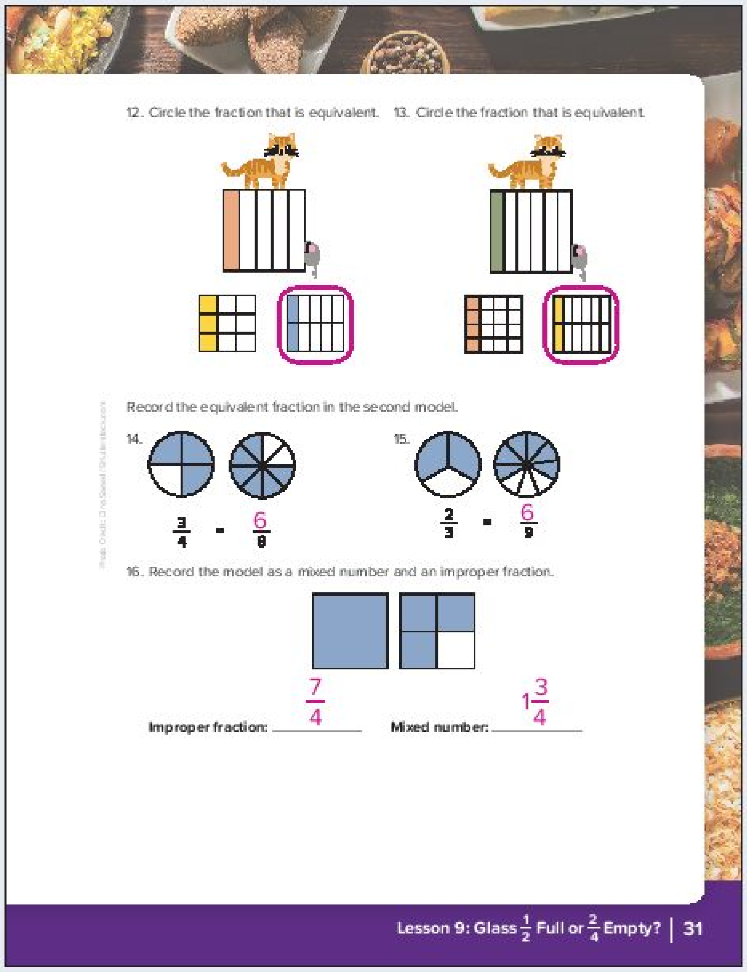
Student Page 31



12. Circle the fraction that is equivalent.

13. Circle the fraction that is equivalent.

Record the equivalent fraction in the second model.

14. $\frac{3}{4} = \frac{6}{8}$

15. $\frac{2}{3} = \frac{6}{9}$

16. Record the model as a mixed number and an improper fraction.

Improper fraction: $\frac{7}{4}$

Mixed number: $1\frac{3}{4}$

Lesson 9: Glass $\frac{1}{2}$ Full or $\frac{2}{4}$ Empty? | 31

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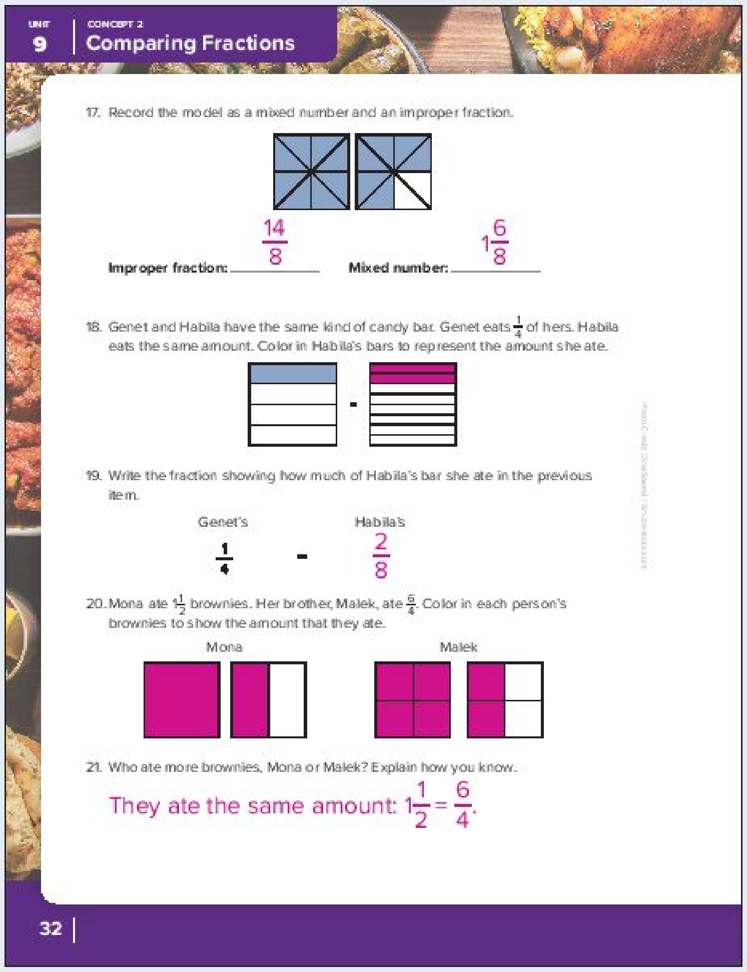
Student Page 32



UNIT 9 | CONCEPT 2 **Comparing Fractions**

17. Record the model as a mixed number and an improper fraction.

Improper fraction: $\frac{14}{8}$ **Mixed number:** $1\frac{6}{8}$

18. Genet and Habila have the same kind of candy bar. Genet eats $\frac{1}{4}$ of hers. Habila eats the same amount. Color in Habila's bars to represent the amount she ate.

19. Write the fraction showing how much of Habila's bar she ate in the previous item.

Genet's $\frac{1}{4}$ = Habila's $\frac{2}{8}$

20. Mona ate $1\frac{1}{2}$ brownies. Her brother, Malek, ate $\frac{6}{4}$. Color in each person's brownies to show the amount that they ate.

21. Who ate more brownies, Mona or Malek? Explain how you know.

They ate the same amount: $1\frac{1}{2} = \frac{6}{4}$.

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10. Ask students to spend the rest of the time working independently or with a partner to complete Problems 10–21.

TEACHER NOTE: This first lesson on equivalence is about identifying equivalent fractions, rather than generating them. However, students may begin to see how to find an equivalent fraction by increasing or decreasing the numerator and the denominator equally. It is important to build a strong visual reference for students, and not just a procedural process.

CONNECT (7 min)

Pizza Contest

Ask students to turn to Lesson 9 CONNECT Pizza Contest and solve the problem independently.

Answer Key for Pizza Contest:
Kareem's pizza was larger so the half he ate was larger than the half Magdy ate. $\frac{1}{2}$ was more. Because the whole pizzas are not the same size, the halves are not equivalent.

TEACHER NOTE: Pizza Fractions is a great opportunity for formative assessment. This learning activity will help you identify students' misconceptions and errors related to equivalent fractions so you can adjust instruction accordingly.

WRAP-UP (3 min)

Let's Chat About Our Learning

Ask volunteers to draw on the board two examples of equivalent fractions and two examples of fractions that are not equivalent fractions. Discuss the fraction models as a class. Ask students to share their reasoning and encourage them to use mathematical language to explain their thinking.

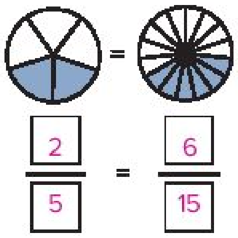
PRACTICE

Direct students to Lesson 9 PRACTICE and have them complete the problems. Address student errors and misconceptions around equivalent fractions.

Check Your Understanding

Write the equivalent proper fractions for each model.

1.



$\frac{\boxed{2}}{\boxed{5}} = \frac{\boxed{6}}{\boxed{15}}$

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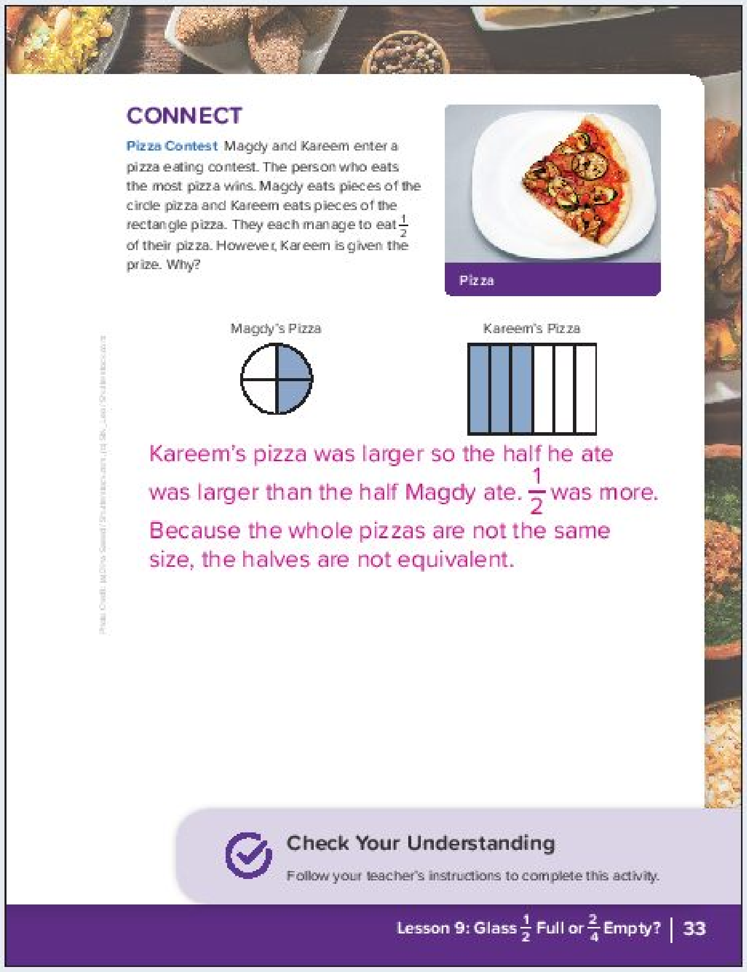
Student Page 33



CONNECT

Pizza Contest Magdy and Kareem enter a pizza eating contest. The person who eats the most pizza wins. Magdy eats pieces of the circle pizza and Kareem eats pieces of the rectangle pizza. They each manage to eat $\frac{1}{2}$ of their pizza. However, Kareem is given the prize. Why?

Pizza

Magdy's Pizza

Kareem's Pizza

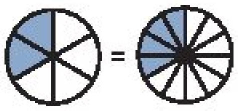
Kareem's pizza was larger so the half he ate was larger than the half Magdy ate. $\frac{1}{2}$ was more. Because the whole pizzas are not the same size, the halves are not equivalent.

Check Your Understanding

Follow your teacher's instructions to complete this activity.

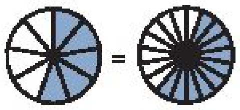
Lesson 9: Glass $\frac{1}{2}$ Full or $\frac{2}{4}$ Empty? | 33

2.



$\frac{\boxed{2}}{\boxed{6}} = \frac{\boxed{4}}{\boxed{12}}$

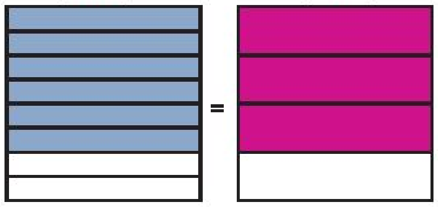
3.



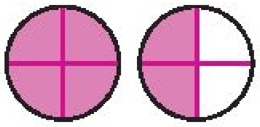
$\frac{\boxed{5}}{\boxed{9}} = \frac{\boxed{10}}{\boxed{18}}$

4. Identify the fraction that is represented by the model. Then, shade an equivalent fraction in the second model.

$\boxed{\frac{6}{8}} = \boxed{\frac{3}{4}}$



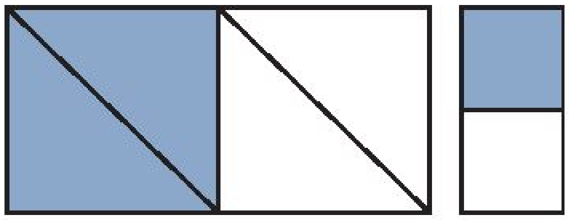
5. Walid baked two cakes for his family and cut each cake into 4 equal pieces. Six people each had 1 piece. Color and record the fraction and mixed number that represents the fraction of cake eaten.



Mixed number = $1\frac{1}{2}$

Improper fraction = $\frac{6}{4}$

6. Are the following fraction models equivalent? Explain your thinking.



They are not equivalent. They both show $\frac{1}{2}$ of a whole, but the size of the whole is not equal.

LESSON 10
Same Fraction, Different Day

Lesson Overview

In this lesson, students review how fractions can be a part of a whole or a set. Next, they create a variety of equivalent fractions and explore a real-world application where equivalency is used to solve problems.

Lesson Essential Question

- What strategies can I use to find equivalent fractions?

Learning Objectives

In this lesson

- Students will use visual models and multiples generate equivalent fractions.
- Students will explain what makes two fractions equivalent.

Grade-Level Standards

4.B.1 Extend understanding of fraction equivalence and ordering.

4.B.1.a Explain cases of fraction equivalency by using visual fraction models

4.B.1.b Explain how the number and size of the parts of equivalent fractions differ even though the two fractions themselves are the same size.

4.B.1.c Identify and generate equivalent fractions.

Vocabulary Check-In

equivalent

Materials List

- Large copy of the Fraction Wall
- Students' domino sets from Unit 9 Lesson 2

Preparation

- Photocopy the Unit 9 Lesson 10 Fraction Wall at the end of this volume.

Photo Credit: nadianb / Shutterstock.com

DIGITAL

Lesson 10

Same Fraction, Different Day

Quick Code:
egmt4110

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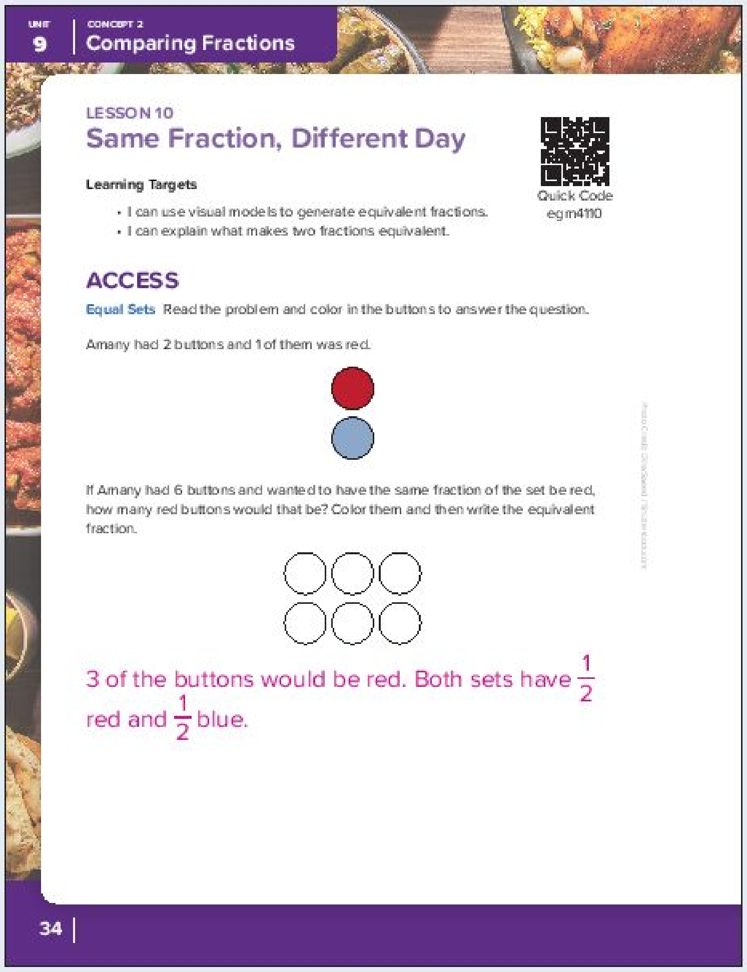
Student Page 34



UNIT 9 | CONCEPT 2 Comparing Fractions

LESSON 10

Same Fraction, Different Day

Learning Targets

- I can use visual models to generate equivalent fractions.
- I can explain what makes two fractions equivalent.

Quick Code egm4110

ACCESS

Equal Sets Read the problem and color in the buttons to answer the question.

Amany had 2 buttons and 1 of them was red.

If Amany had 6 buttons and wanted to have the same fraction of the set be red, how many red buttons would that be? Color them and then write the equivalent fraction.

3 of the buttons would be red. Both sets have $\frac{1}{2}$ red and $\frac{1}{2}$ blue.

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ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students sometimes think that if the denominators are different, the fractions cannot be equal.

Equal Sets

1. Ask students to turn to Lesson 10 ACCESS Equal Sets and chorally read the Learning Targets. Ask students to do a Fist-to-Five to self-assess their current confidence related to equivalent fractions.
2. Ask students to read and solve the problem and give you a Thumbs-Up when they are ready to share their thinking with the class.
3. Ask students to share their answers and reasoning.
4. Review with students the meaning of equivalent and remind them that fractions can be parts of a whole or parts of a set. This problem was a fraction of a set of buttons, but half of both sets was red.
5. Ask for a volunteer to draw another set of buttons on the board and shade in a fraction equivalent to $\frac{1}{2}$ and $\frac{3}{6}$.

Answer Key for Equal Sets:

3 of the buttons would be red. Both sets have $\frac{1}{2}$ red and $\frac{1}{2}$ blue

BUILD (40 min)

Fraction Wall (15 min)

TEACHER NOTE: Students used a fraction wall in Primary 3, so this should be a familiar tool for them.

1. Direct students to Lesson 10 BUILD Fraction Wall.
2. Invite students to discuss what they notice, including what equivalent fractions they see. Ask students to solve Problem 1.
3. Discuss the answer to Problem 1 and ask students to share the strategies they used to identify fractions equivalent to $\frac{1}{4}$.
4. If necessary, remind students how to find an equivalent fraction by looking at the end of the bar (example $\frac{1}{2}$) and traveling up or down the wall to find a fraction that takes up the same amount of the whole.
5. Ask students to solve Problem 2. After a minute, ask students to share their answers.

Answer Key for Fraction Wall:

1. $\frac{2}{8}, \frac{3}{12}$
2. $\frac{4}{6}, \frac{6}{9}, \frac{8}{12}$

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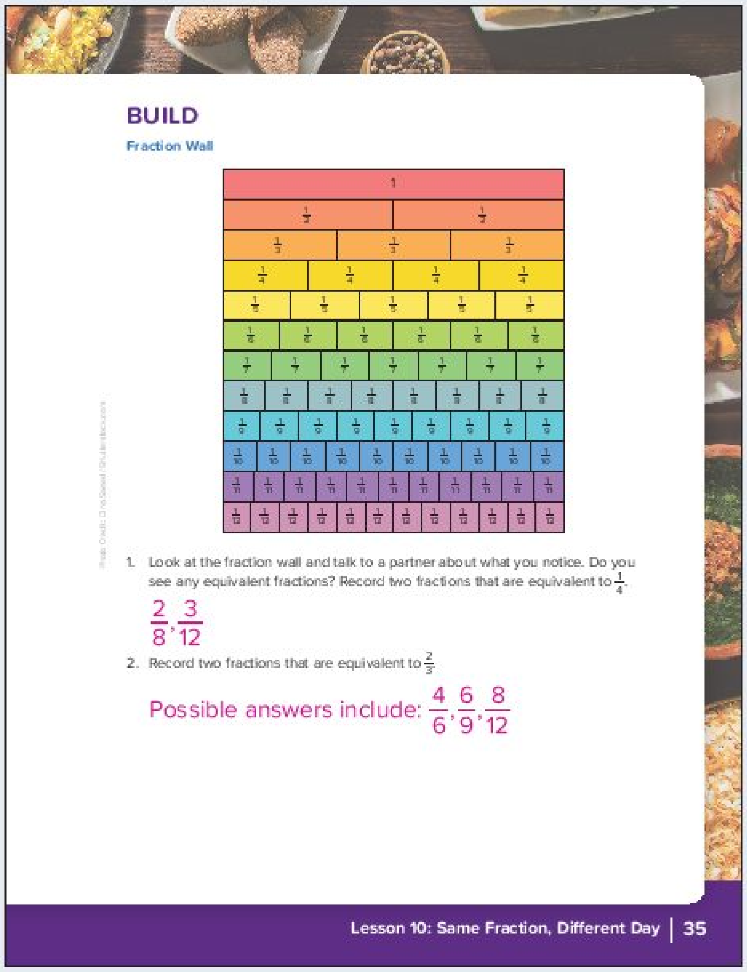

BUILD

Fraction Wall

1
1/2 1/2
1/3 1/3 1/3
1/4 1/4 1/4 1/4
1/5 1/5 1/5 1/5 1/5
1/6 1/6 1/6 1/6 1/6 1/6
1/7 1/7 1/7 1/7 1/7 1/7 1/7
1/8 1/8 1/8 1/8 1/8 1/8 1/8 1/8
1/9 1/9 1/9 1/9 1/9 1/9 1/9 1/9 1/9
1/10 1/10 1/10 1/10 1/10 1/10 1/10 1/10 1/10 1/10
1/11 1/11 1/11 1/11 1/11 1/11 1/11 1/11 1/11 1/11 1/11
1/12 1/12 1/12 1/12 1/12 1/12 1/12 1/12 1/12 1/12 1/12 1/12

1. Look at the fraction wall and talk to a partner about what you notice. Do you see any equivalent fractions? Record two fractions that are equivalent to $\frac{1}{4}$.

$\frac{2}{8}, \frac{3}{12}$

2. Record two fractions that are equivalent to $\frac{2}{3}$

Possible answers include: $\frac{4}{6}, \frac{6}{9}, \frac{8}{12}$

Lesson 10: Same Fraction, Different Day | 35

Domino Fun (25 min)

1. Direct students to Lesson 10 BUILD Domino Fun.
2. Model the activity by creating equivalent fractions on the board for one domino.
   - Choose a domino and position it so that it represents a fraction less than 1.
   - Record the fraction in the table.
   - Write three fractions that are equivalent to the first fraction.
   - Use fraction models to explain your reasoning to your partner.
   - Repeat with other dominoes.
3. Hand out (or have students take out) the sets of dominoes they used in Unit 9 Lesson 2. Use Hands Up, Pair Up to help students find partners. Allow students to play Domino Fun for the rest of BUILD.

   TEACHER NOTE: Based on your students' level of readiness, you can add challenge to use dominoes that show fractions larger than 1 and then find and model equivalent fractions for these mixed numbers. As students work, walk around to ensure that they understand that both the denominator and the numerator must increase or decrease by the same amount. Also, ensure that students can draw visual models to prove equivalence. Note students who are having difficulty and pull them into a small group for additional instruction and support.

CONNECT (7 min)

Recipe Trouble

Direct students to Lesson 10 CONNECT Recipe Trouble and ask them to read the problem and the recipe. Ask students to rewrite the recipe using equivalent fractions.

Answer Key for Recipe Trouble:

$\frac{2}{4}$ cup rolled oats
$\frac{8}{4}$ cup crispy rice cereal
$\frac{1}{4}$ cup honey
$\frac{6}{4}$ cup peanut butter
$\frac{2}{4}$ teaspoon of vanilla
$\frac{4}{4}$ cup chocolate chips

TEACHER NOTE: Collect students' books and review their solutions to the CONNECT problem. Use the information to identify students who need additional instruction and support. Consider having them work with a partner who is not struggling to solve review problems.

WRAP-UP (3 min)

Let's Chat About Our Learning

Ask students to discuss their thinking related to the Essential Question. Encourage students to ask questions of each other and clear up any lingering misconceptions.

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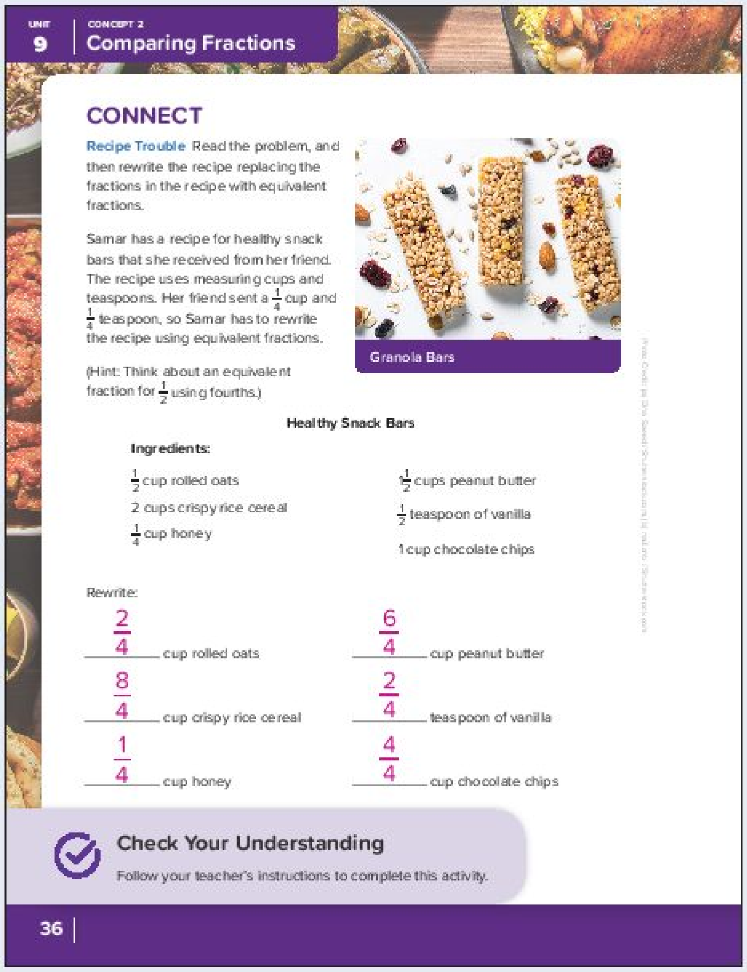

UNIT 9 | CONCEPT 2 Comparing Fractions

CONNECT

Recipe Trouble Read the problem, and then rewrite the recipe replacing the fractions in the recipe with equivalent fractions.

Samar has a recipe for healthy snack bars that she received from her friend. The recipe uses measuring cups and teaspoons. Her friend sent a $\frac{1}{4}$ cup and $\frac{1}{4}$ teaspoon, so Samar has to rewrite the recipe using equivalent fractions.

(Hint: Think about an equivalent fraction for $\frac{1}{2}$ using fourths.)

Granola Bars

Healthy Snack Bars

Ingredients:

$\frac{1}{2}$ cup rolled oats
2 cups crispy rice cereal
$\frac{1}{4}$ cup honey
$1\frac{1}{2}$ cups peanut butter
$\frac{1}{2}$ teaspoon of vanilla
1 cup chocolate chips

Rewrite:

$\frac{2}{4}$ cup rolled oats
$\frac{8}{4}$ cup crispy rice cereal
$\frac{1}{4}$ cup honey
$\frac{6}{4}$ cup peanut butter
$\frac{2}{4}$ teaspoon of vanilla
$\frac{4}{4}$ cup chocolate chips

Check Your Understanding

Follow your teacher's instructions to complete this activity.

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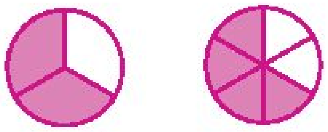
PRACTICE

Direct students to Lesson 8 PRACTICE and have them complete the problems. Address student errors and misconceptions around comparing and ordering fractions.

Check Your Understanding

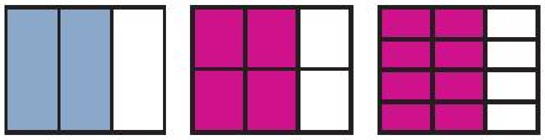
1. Record the first fraction shown. Next, create an equivalent fraction model. Record the equivalent fraction underneath your new model.



Fraction = $\frac{2}{3}$ Equivalent Fraction = $\frac{4}{6}$

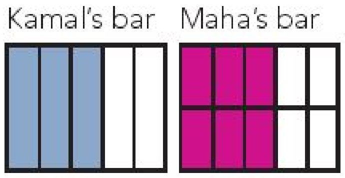
2. Hossam was using his fraction wall to find a fraction equivalent to $\frac{2}{5}$. He told his teacher that $\frac{2}{10}$ was equivalent. Do you agree or disagree? Explain your thinking.
$\frac{2}{5}$ is not equivalent to $\frac{2}{10}$. The denominator changed, but the numerator did not, so the fractions cannot be equivalent.

3. Create two equivalent fractions for $\frac{2}{3}$ using the rectangles shown. Record the equivalent fractions.



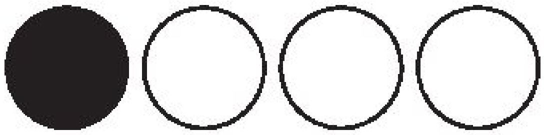
$\frac{2}{3}$ = $\frac{4}{6}$ and $\frac{8}{12}$

4. Kamal and Maha have candy bars that are the same size. Kamal eats $\frac{3}{5}$ of his candy bar. If Maha eats an equivalent fraction of her bar, draw how much she ate and record the equivalent fraction.

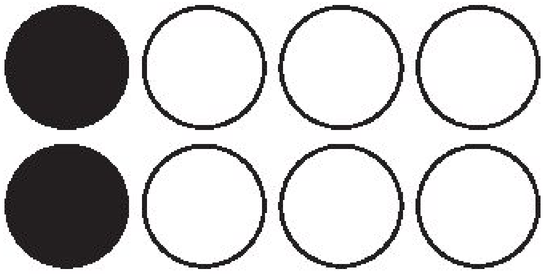


$\frac{3}{5}$ = $\frac{6}{10}$ or any other equivalent fraction $\frac{9}{15}$, $\frac{12}{20}$

5. Look at the sets below. Record what fraction of each set is black.



Fraction = $\frac{1}{4}$



Fraction = $\frac{2}{8}$

Are the two fractions that represent the amount shaded black equivalent? Explain.
Yes, the fraction represents equivalent black parts of the sets. Accept anything that demonstrates an understanding that the numerator and the denominator increased by the same amount and each shows $\frac{1}{4}$ of a set that is black.

Materials List

- Fraction Anchor Chart
- Unit 9 Lesson 11 Mixed-Up Fraction Cards

Preparation

Photocopy one set of Mixed-Up Fraction Cards per pair of students. See Blackline Master at the end of this volume.

Photo Credit: Dina Saeed / Shutterstock.com

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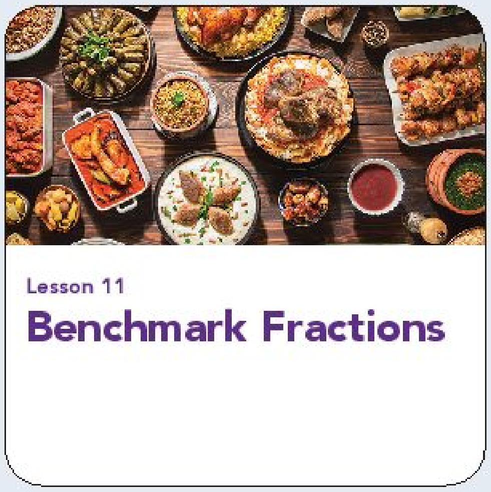

Lesson 11

Benchmark Fractions

Quick Code:
egmt4111

LESSON 11
Benchmark Fractions

Lesson Overview

In this lesson, students explore benchmark fractions of 0, $\frac{1}{2}$, and 1, and discuss $1\frac{1}{2}$ and 2. They create equivalent fractions for these benchmark fractions and then sort a variety of fractions matching them to their equivalent benchmark fractions and in real-world problems.

Lesson Essential Question

- Why are benchmark fractions useful in problem solving and in comparing fractions?

Learning Objectives

In this lesson

- Students will identify benchmark fractions.
- Students will generate fractions equivalent to benchmark fractions.

Grade-Level Standards

4.B.1.b Explain how the number and size of the parts of equivalent fractions differ even though the two fractions themselves are the same size.

4.B.1.c Identify and generate equivalent fractions.

4.B.1.d Compare two fractions using different strategies (for example, by comparing two fractions with different numerators and different denominators by creating like denominators or numerators or comparing to a benchmark fraction).

Vocabulary Check-In

benchmark fraction, equivalency

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students often believe that the larger the denominator the closer to a benchmark of 1 (for example, they may think $\frac{1}{4}$ is closer to 1 than $\frac{1}{2}$ because 4 is greater than 2).

Walking the Path

1. Ask students to turn to Lesson 11 ACCESS Walking the Path. Ask them to read the problem silently and draw where they think the benches should go. Ask students to give you a Thumbs-Up when they are finished.
2. Draw on the board a number line path similar to the one in the Student Materials. Ask students to discuss where they placed the benches and why.
3. Explain to students that 0, $\frac{1}{2}$, and 1 are benchmark fractions. Benchmark fractions are common fractions that can help us compare fractions.
4. Ask students to identify other benchmark fractions that might be helpful to know.
   $\frac{1}{4}$, $\frac{3}{4}$, 1, $\frac{1}{2}$, and 2 are usually the ones most commonly used as benchmarks.
5. Add the definition of *benchmark fraction* (common and helpful fractions that can help us compare fractions) and examples to the Fraction Anchor Chart.

Answer Key for Walking the Path:
$\frac{0}{8}$ is the same as 0, $\frac{4}{8}$ is the middle or $\frac{1}{2}$ of the path, and $\frac{8}{8}$ is the same as 1. Students should draw benches under the number line in those spots.

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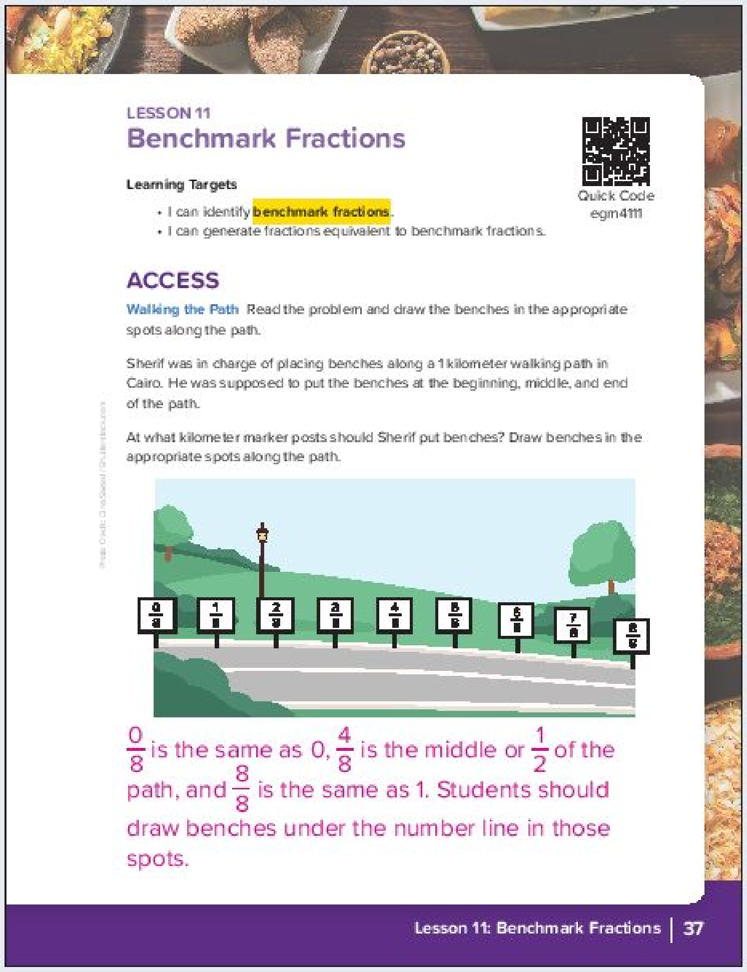
Student Page 37



LESSON 11

Benchmark Fractions

Quick Code
egm4111

Learning Targets

- I can identify **benchmark fractions**.
- I can generate fractions equivalent to benchmark fractions.

ACCESS

Walking the Path Read the problem and draw the benches in the appropriate spots along the path.

Sherif was in charge of placing benches along a 1 kilometer walking path in Cairo. He was supposed to put the benches at the beginning, middle, and end of the path.

At what kilometer marker posts should Sherif put benches? Draw benches in the appropriate spots along the path.

$\frac{0}{8}$ is the same as 0, $\frac{4}{8}$ is the middle or $\frac{1}{2}$ of the path, and $\frac{8}{8}$ is the same as 1. Students should draw benches under the number line in those spots.

Lesson 11: Benchmark Fractions | 37

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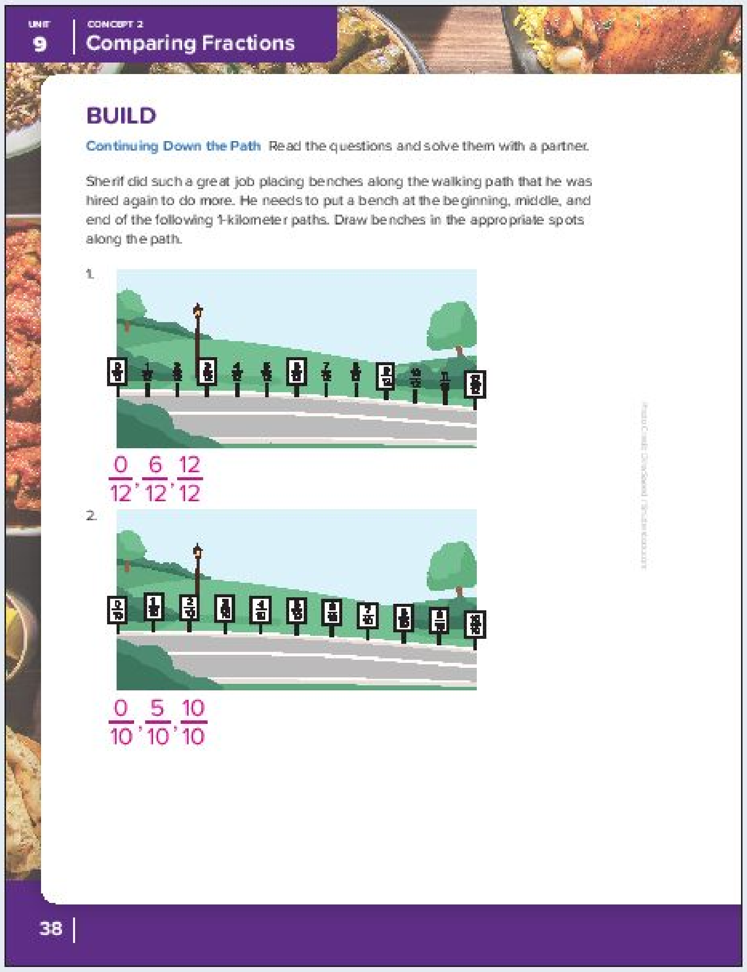
Student Page 38



UNIT 9 | CONCEPT 2 Comparing Fractions

BUILD

Continuing Down the Path Read the questions and solve them with a partner.

Sherif did such a great job placing benches along the walking path that he was hired again to do more. He needs to put a bench at the beginning, middle, and end of the following 1-kilometer paths. Draw benches in the appropriate spots along the path.

1.

$\frac{0}{12}, \frac{6}{12}, \frac{12}{12}$

2.

$\frac{0}{10}, \frac{5}{10}, \frac{10}{10}$

38

BUILD (40 min)

Continuing Down the Path
(15 min)

1. Ask a volunteer to read the Learning Targets aloud. Explain that today's lesson is about identifying benchmark fractions and generating fractions equivalent to those benchmarks.
2. Direct students to Lesson 11 BUILD Continuing Down the Path. Ask them to solve the problems with their Shoulder Partner, recording the benches on the new paths.
3. After a few minutes, go over the answers together. Use Calling Sticks to choose students to explain their reasoning. Ask students to model their thinking on the board.

4. Ask students to Turn and Talk about the following:

ASK

- *If $\frac{4}{8}$, $\frac{5}{10}$, and $\frac{6}{12}$ are all equivalent to $\frac{1}{2}$, what is true about each of these fractions?*
  They can all be called one-half.
- *What is the relationship between the numerator and the denominator in the benchmark fraction $\frac{1}{2}$?*
  The numerator is half of the denominator.
- *What operation can you use to calculate the numerator of a fraction equivalent to $\frac{1}{2}$ if you only know the denominator?*
  Divide the denominator by 2 to get the numerator.

TEACHER NOTE: At this point, students have created equivalent fractions for benchmarks as well as other proper fractions. They should notice that the numerator and denominator must increase or decrease by the same factor to be equivalent. This understanding enables them to compare fractions to benchmarks and to each other, and to add and subtract fractions with unlike denominators later. A solid grasp of equivalence is important. If students are still struggling, do the next activity in a small group with those students.

Mixed-Up Fraction Game (25 min)

1. Direct students to Lesson 11 BUILD Mixed-Up Fractions and go over the directions with the group.
   - Shuffle the fraction cards and place them face down in a pile.
   - Player 1 turns over the top card and places the card in the correct spot on the board, explaining their reasoning. Player 2 must agree or disagree. If players disagree, they must discuss until they come to a consensus. If the card does not match any benchmark, discard it. *Some cards are visual models of fractions.
   - Player 2 takes their turn, repeating the process.
   - Continue until all cards are placed or discarded.
2. Assign students partners or let students select them. Partners will spend the rest of BUILD playing Mixed Up Fractions.

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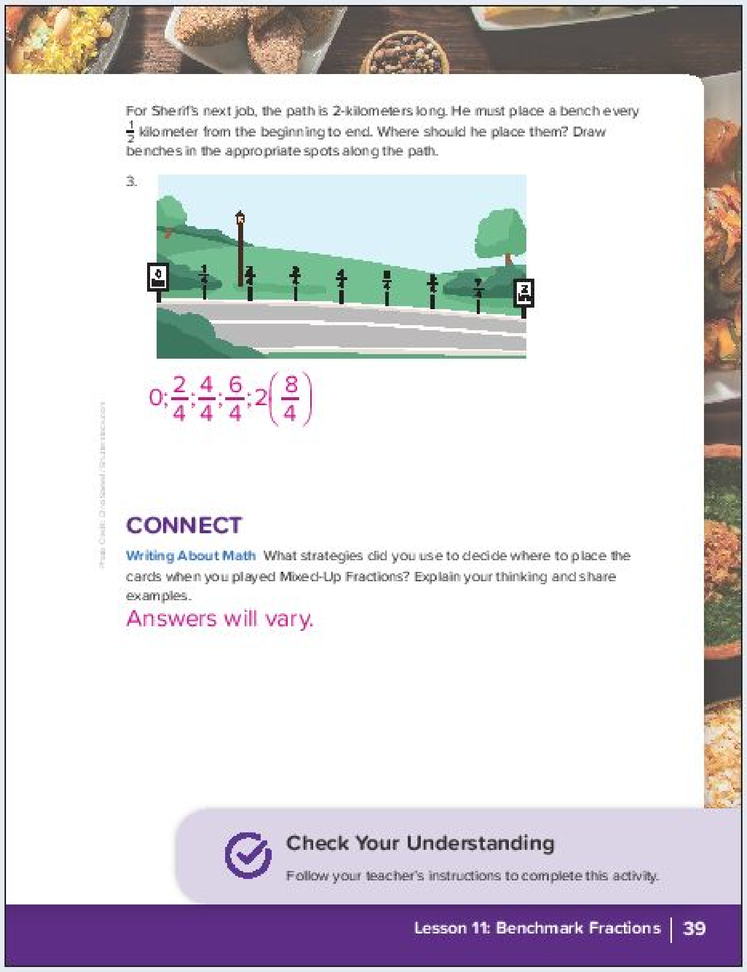
Student Page 39



For Sherif's next job, the path is 2-kilometers long. He must place a bench every $\frac{1}{2}$ kilometer from the beginning to end. Where should he place them? Draw benches in the appropriate spots along the path.

3.

$0; \frac{2}{4}; \frac{4}{4}; \frac{6}{4}; 2 \left(\frac{8}{4}\right)$

CONNECT

Writing About Math What strategies did you use to decide where to place the cards when you played Mixed-Up Fractions? Explain your thinking and share examples.

Answers will vary.

Check Your Understanding

Follow your teacher's instructions to complete this activity.

Lesson 11: Benchmark Fractions | 39

CONNECT (7 min)

Writing About Math

Ask students to turn to Lesson 11 CONNECT Writing About Math and respond to the prompt.

WRAP-UP (3 min)

Let's Chat About Our Learning

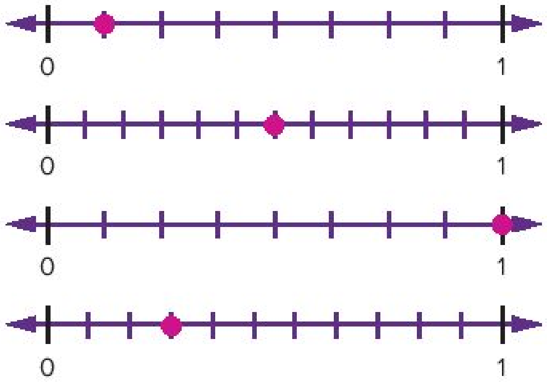
Ask volunteers to discuss the strategies they wrote about in CONNECT. Encourage students to ask each other questions. Allow students to demonstrate their thinking on the board.

PRACTICE

Direct students to Lesson 9 PRACTICE and have them complete the problems. Address student errors and misconceptions around benchmark fractions.

Check Your Understanding

1. Nour is at soccer practice. He made exactly half of the 14 shots he took on goal. How many shots did he make? State your answer as a fraction.
   $\frac{7}{14}$ or $\frac{1}{2}$
2. Sara wants to split a pizza with her brother equally. The pizza has been cut into 20 slices. How many slices will Sara get? State your answer as a fraction.
   $\frac{10}{20}$ or $\frac{1}{2}$
3. Nagi went on a 2 kilometer hike last Saturday with his sister. The hike was marked every $\frac{1}{6}$ of a kilometer. He stopped at $1\frac{1}{2}$ kilometers to wait for his sister. How many sixths had he hiked? State your answer as an improper fraction.
   $\frac{9}{6}$
4. Show where each fraction would be on the number line. Then, decide if it is closest to 0, $\frac{1}{2}$, or 1 and check that box.



5. Mona made 2 pizzas and cut each of them into 8 pieces. If her brothers ate $1\frac{1}{2}$ of the pizzas, how many slices did they eat? State your answer as an improper fraction.
   $\frac{12}{8}$

Materials List

- Paper clip for Spin to Win
- Pencil for Spin to Win

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DIGITAL

Lesson 12

Half or Whole?

Quick Code:
egmt4112

LESSON 12
Half or Whole?

Lesson Overview

In this lesson, students use their understanding of benchmark fractions to compare a variety of proper fractions. They compare fractions as bare numbers as well as in a story problem format.

Lesson Essential Question

- Why are benchmark fractions useful in problem solving and in comparing fractions?

Learning Objective

In this lesson

- Students will compare fractions to a benchmark fraction.

Grade-Level Standard

4.B.1.d Compare two fractions using different strategies (for example, by comparing two fractions with different numerators and different denominators by creating like denominator or numerators or comparing to a benchmark fraction).

Vocabulary Check-In

compare, equivalent, benchmark

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may not be able to find equivalent fractions for benchmarks, so comparing a fraction to a benchmark may be difficult.
- Students may be confused that even though whole numbers increase in size as we count ($1 < 2 < 3 < 4$), fractions do not increase in size when the denominator does $\left(\frac{1}{1} > \frac{1}{2} > \frac{1}{3} > \frac{1}{4}\right)$.

Error Analysis

1. Ask students to turn to Lesson 12 ACCESS Error Analysis and complete the error analysis.
2. After a few minutes, review the answers as a class.

Answer Key for Error Analysis:
The student understood that both numerators were the same, but the larger denominator (12) means that there are more pieces, so each piece is smaller. The correct answer is $\frac{3}{8}$ is closer to 1 whole.

TEACHER NOTE: Remind students of the work they did comparing in Lesson 8. $\frac{1}{12}$ is smaller than $\frac{1}{8}$, so $\frac{3}{8}$ is closer to one whole. Students may draw visual models to show the size of each or they might think about benchmarks, but that is discussed further in BUILD.

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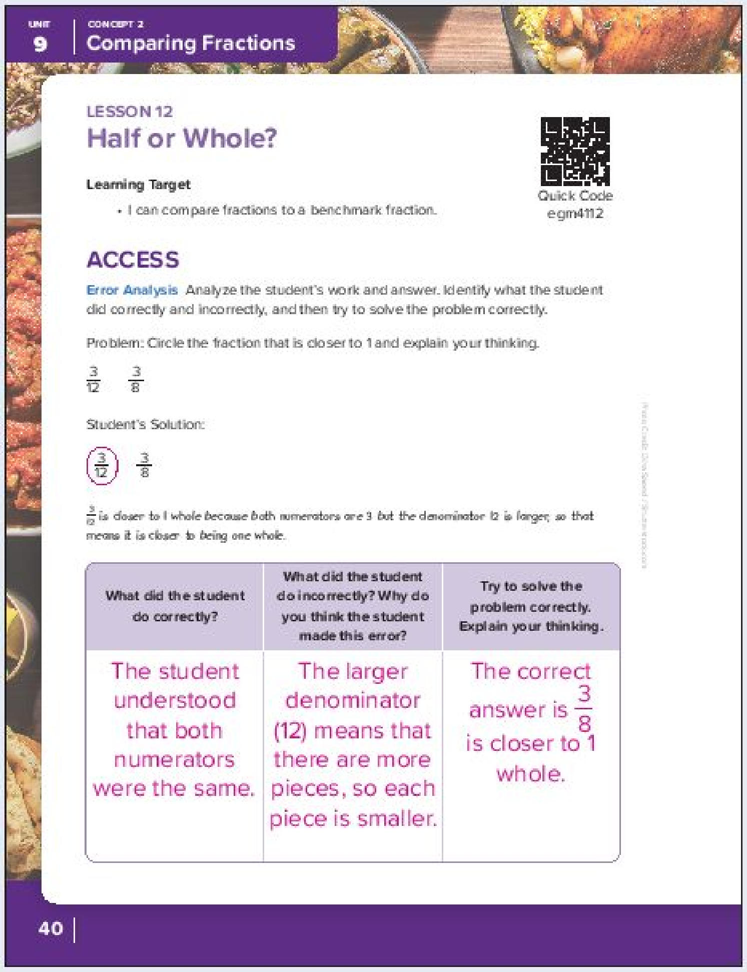
Student Page 40



UNIT 9 | CONCEPT 2 Comparing Fractions

LESSON 12

Half or Whole?

Learning Target

- I can compare fractions to a benchmark fraction.

Quick Code
egm4112

ACCESS

Error Analysis Analyze the student's work and answer. Identify what the student did correctly and incorrectly, and then try to solve the problem correctly.

Problem: Circle the fraction that is closer to 1 and explain your thinking.

$\frac{3}{12}$ $\frac{3}{8}$

Student's Solution:

$\frac{3}{12}$ $\frac{3}{8}$

$\frac{3}{12}$ is closer to 1 whole because both numerators are 3 but the denominator 12 is larger, so that means it is closer to being one whole.

What did the student do correctly?	What did the student do incorrectly? Why do you think the student made this error?	Try to solve the problem correctly. Explain your thinking.
The student understood that both numerators were the same.	The larger denominator (12) means that there are more pieces, so each piece is smaller.	The correct answer is $\frac{3}{8}$ is closer to 1 whole.

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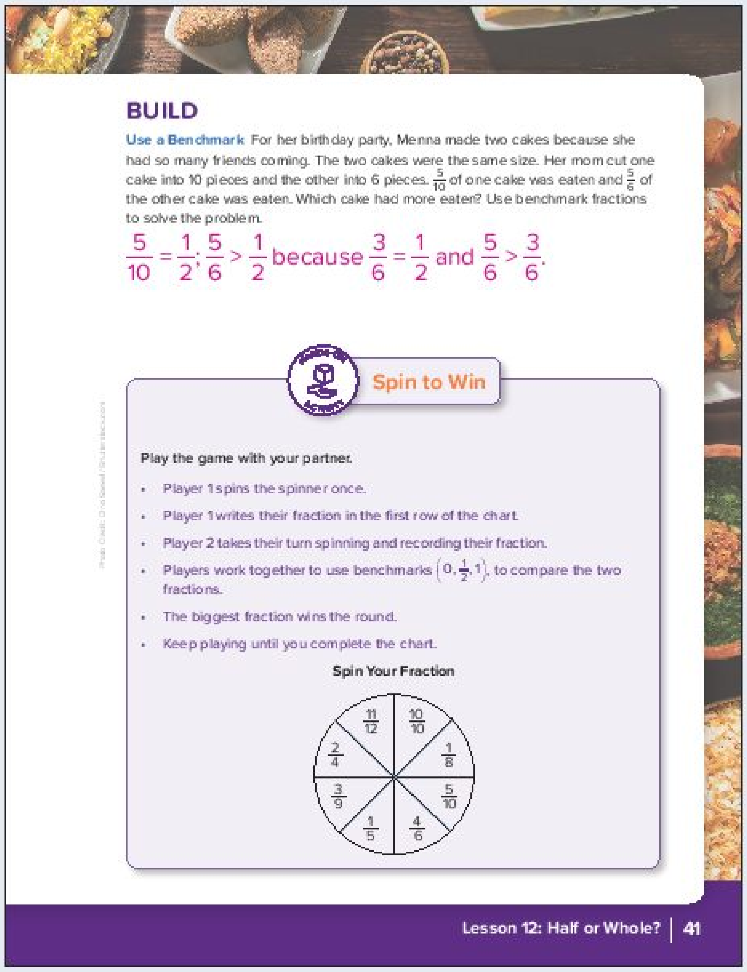
Student Page 41



BUILD

Use a Benchmark For her birthday party, Menna made two cakes because she had so many friends coming. The two cakes were the same size. Her mom cut one cake into 10 pieces and the other into 6 pieces. $\frac{5}{10}$ of one cake was eaten and $\frac{5}{6}$ of the other cake was eaten. Which cake had more eaten? Use benchmark fractions to solve the problem.

$\frac{5}{10} = \frac{1}{2}$; $\frac{5}{6} > \frac{1}{2}$ because $\frac{3}{6} = \frac{1}{2}$ and $\frac{5}{6} > \frac{3}{6}$.

Spin to Win

Play the game with your partner.

- Player 1 spins the spinner once.
- Player 1 writes their fraction in the first row of the chart.
- Player 2 takes their turn spinning and recording their fraction.
- Players work together to use benchmarks $\left(0, \frac{1}{2}, 1\right)$, to compare the two fractions.
- The biggest fraction wins the round.
- Keep playing until you complete the chart.

Spin Your Fraction

Lesson 12: Half or Whole? | 41

BUILD (40 min)

Use a Benchmark (15 min)

1. Record $\frac{1}{2} = \frac{?}{12}$ and $\frac{1}{2} = \frac{?}{8}$ on the board and ask students to identify the numerators in fraction. (6, 4) Ask students to explain how they figured it out.

2. Ask students how using the benchmark of $\frac{1}{2}$ could have helped the student in the ACCESS problem compare $\frac{3}{12}$ and $\frac{3}{8}$.

3. Use Calling Sticks to choose students to share their ideas. Make sure students understand that, if the student in the ACCESS problem had used $\frac{1}{2}$ as a benchmark and understood that $\frac{3}{8}$ is close to $\frac{4}{8}$ $(\frac{1}{2})$ it may have helped them compare accurately.

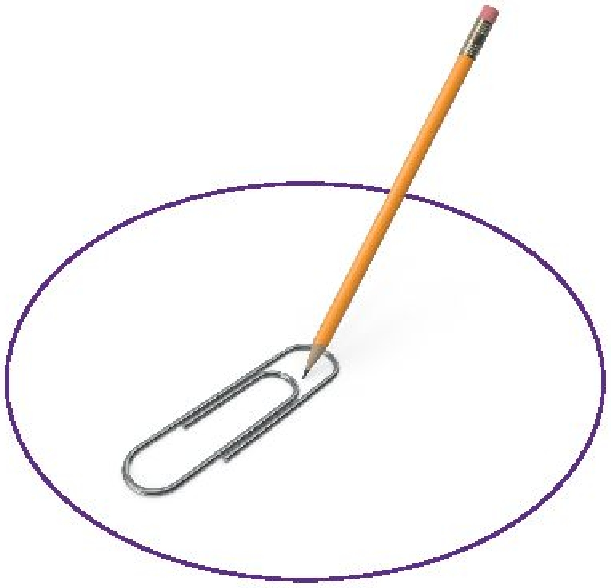
4. Direct students to Lesson 12 BUILD Use A Benchmark. Ask students to work with a partner to solve the problem. Emphasize that students should use benchmark fractions to solve the problem.

5. After a minute, discuss the problem as a group, reinforcing the concept that understanding benchmark fractions like $\frac{1}{2}$ can make it easier for us to compare fractions.

   TEACHER NOTE: Some students may still need to draw visual models to compare, but help them think about whether the fractions are larger or smaller than $\frac{1}{2}$ or closer to 0 or 1. Additionally, continue to emphasize that the greater the number of pieces a whole is cut into, the smaller the pieces. In order to compare, the two wholes must be the same size.

Spin to Win (10 min)

1. Direct students to Lesson 12 BUILD Spin to Win and read the directions with them. Answer any student questions and model how to use a pencil and a paperclip to make the spinner.



2. Explain to students that once they have completed the chart, they will work with their partner to solve the story problems that follow the game. Emphasize that students should use benchmark fractions to play the game and solve the problems.

Story Problems (15 min)

1. Use Hands Up, Pair Up to help students find partners. Give students time to play the game and solve the story problems.
2. When 5 minutes are left in BUILD, bring the group back together to go over the answers. Ask students to explain their reasoning and, if applicable, show their work on the board.

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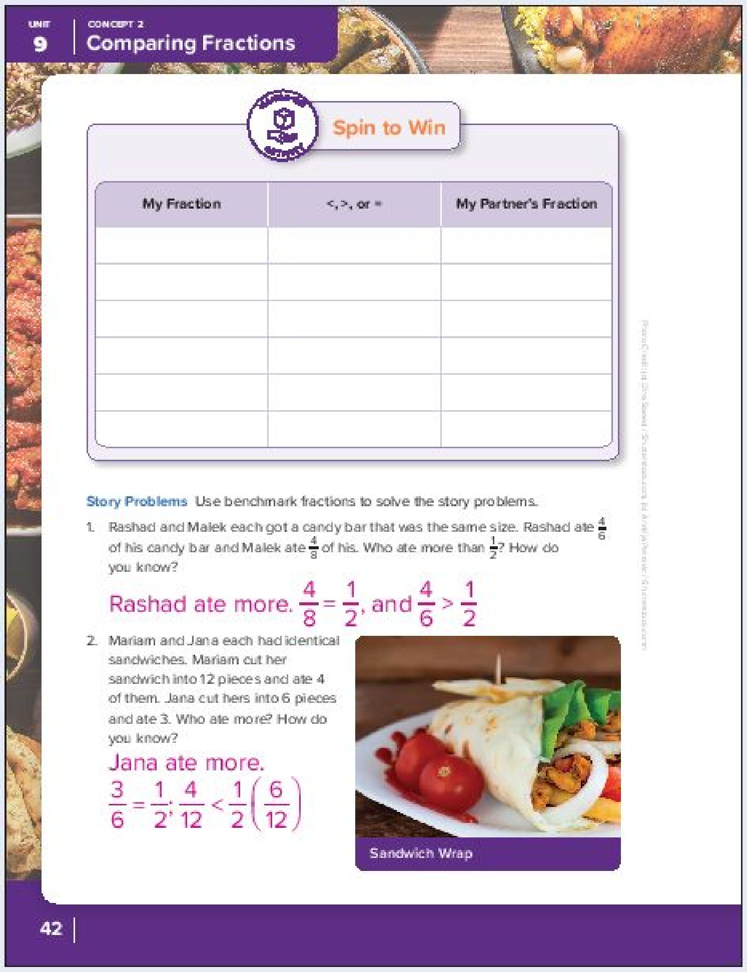
Student Page 42



UNIT 9 | CONCEPT 2
Comparing Fractions

Spin to Win

My Fraction	<, >, or =	My Partner's Fraction

Story Problems Use benchmark fractions to solve the story problems.

1. Rashad and Malek each got a candy bar that was the same size. Rashad ate $\frac{4}{6}$ of his candy bar and Malek ate $\frac{4}{8}$ of his. Who ate more than $\frac{1}{2}$? How do you know?

   Rashad ate more. $\frac{4}{8} = \frac{1}{2}$, and $\frac{4}{6} > \frac{1}{2}$

2. Mariam and Jana each had identical sandwiches. Mariam cut her sandwich into 12 pieces and ate 4 of them. Jana cut hers into 6 pieces and ate 3. Who ate more? How do you know?

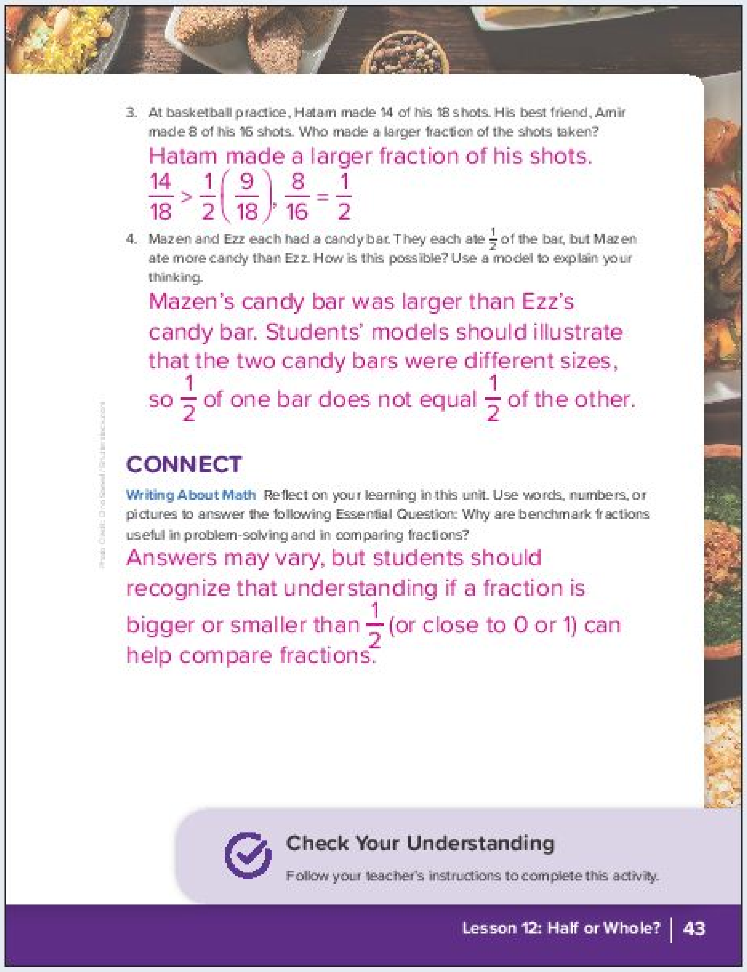
   Jana ate more.
   $\frac{3}{6} = \frac{1}{2}; \frac{4}{12} < \frac{1}{2}\left(\frac{6}{12}\right)$

Sandwich Wrap

42

PRINT

Student Page 43



3. At basketball practice, Hatam made 14 of his 18 shots. His best friend, Amir made 8 of his 16 shots. Who made a larger fraction of the shots taken?

   Hatam made a larger fraction of his shots. $\frac{14}{18} > \frac{1}{2}\left(\frac{9}{18}\right), \frac{8}{16} = \frac{1}{2}$

4. Mazen and Ezz each had a candy bar. They each ate $\frac{1}{2}$ of the bar, but Mazen ate more candy than Ezz. How is this possible? Use a model to explain your thinking.

   Mazen's candy bar was larger than Ezz's candy bar. Students' models should illustrate that the two candy bars were different sizes, so $\frac{1}{2}$ of one bar does not equal $\frac{1}{2}$ of the other.

CONNECT

Writing About Math Reflect on your learning in this unit. Use words, numbers, or pictures to answer the following Essential Question: Why are benchmark fractions useful in problem-solving and in comparing fractions?

Answers may vary, but students should recognize that understanding if a fraction is bigger or smaller than $\frac{1}{2}$ (or close to 0 or 1) can help compare fractions.

Check Your Understanding

Follow your teacher's instructions to complete this activity.

Lesson 12: Half or Whole? | 43

Answer Key to Story Problems:

1. Rashad ate more. $\frac{4}{8} = \frac{1}{2}$, and $\frac{4}{6} > \frac{4}{8}\left(\frac{1}{2}\right)$.
2. Jana ate more. $\frac{3}{6} = \frac{1}{2}$, $\frac{4}{12} < \frac{1}{2}\left(\frac{6}{12}\right)$
3. Hatam made a larger fraction of his shots. $\frac{14}{18} > \frac{1}{2}\left(\frac{9}{18}\right)$, $\frac{8}{16} = \frac{1}{2}$
4. Mazen's candy bar was bigger than Ezz's candy bar. Students' models should illustrate that the 2 candy bars were different sizes, so $\frac{1}{2}$ of 1 bar does not equal $\frac{1}{2}$ of the other.

CONNECT (7 min)

Writing About Math

Ask students to turn to Lesson 12 CONNECT Writing About Math and respond to the prompt.

Answer Key for Writing About Math:

Answers may vary, but students should recognize that understanding if a fraction is bigger or smaller than $\frac{1}{2}$ (or close to 0 or 1) can help compare fractions.

WRAP-UP (3 min)

Let's Chat About Our Learning

Ask students to share their Writing About Math responses. Encourage students to ask each other questions. Ask volunteers to model their thinking on the board, if helpful.

PRACTICE

Direct students to Lesson 11 PRACTICE and have them complete the problems. Address student errors and misconceptions around comparing fractions.

Check Your Understanding

Recipe for Sahlab

$\frac{1}{4}$ liter of milk

$\frac{1}{12}$ liter of filtered water

$1\frac{1}{2}$ tablespoons corn flour

1 tablespoon sugar

$\frac{1}{2}$ tablespoon rose water

A pinch of cinnamon and crushed pistachios for topping

1. Amir wants to make Sahlab for himself and 2 friends, so he needs to triple the recipe. How much of each ingredient will he need? Fill in the new recipe.

   $\frac{3}{4}$ liter of milk

   $\frac{3}{12}$ liter of filtered water

   $4\frac{1}{2}$ tablespoon corn flour

   3 tablespoon sugar

   $1\frac{1}{2}$ tablespoon rose water

2. Now that Amir knows how much he needs, he looks in his cupboard and finds the following:

   $\frac{1}{2}$ liter of milk
   $\frac{1}{2}$ liter of filtered water
   4 tablespoons corn flour
   5 tablespoons sugar
   1 tablespoon rose water

   Does Amir have enough of each ingredient? If not, list the ingredients Amir needs more of. Use benchmark fractions to help you decide.
   Amir does not have enough milk, corn flour, or rose water. $\frac{3}{4} > \frac{1}{2}$ (milk), $\frac{3}{12} < \frac{1}{2}$ (filtered water), $4\frac{1}{2} > 4$ (corn flour), $3 < 5$ (sugar), $1\frac{1}{2} > 1$ (rose water)

Materials List

- Materials may vary

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DIGITAL

Concept Check-In and Remediation

Quick Code:
egmt4113

Concept Check-In and Remediation

Lesson Overview

In this lesson, students work to correct misconceptions and errors from Concept Two: Comparing Fractions. First, administer the Concept Check-In. Once you have reviewed the quiz results, choose remediation activities based on the needs of your students. Some recommendations are listed in the chart, but the needs of your particular students should inform your choices. Students may work independently, in pairs, or in a small group with the teacher.

Concept Essential Questions:

- What strategies can I use to find equivalent fractions?
- Why are benchmark fractions useful in problem solving and in comparing fractions?

Learning Objective

In this lesson

- Students will work to correct misconceptions and errors related to comparing fractions.

Grade-Level Standards

4.B.1. Extend understanding of fraction equivalence and ordering.

4.B.1.a Explain cases of fraction equivalency by using visual fraction models.

4.B.1.b Explain how the number and size of the parts of equivalent fractions differ even though the two fractions themselves are the same size.

4.B.1.c Identify and generate equivalent fractions.

4.B.1.d Compare two fractions using different strategies (for example, by comparing two fractions with different numerators and different denominators by creating like denominator or numerators or comparing to a benchmark fraction).

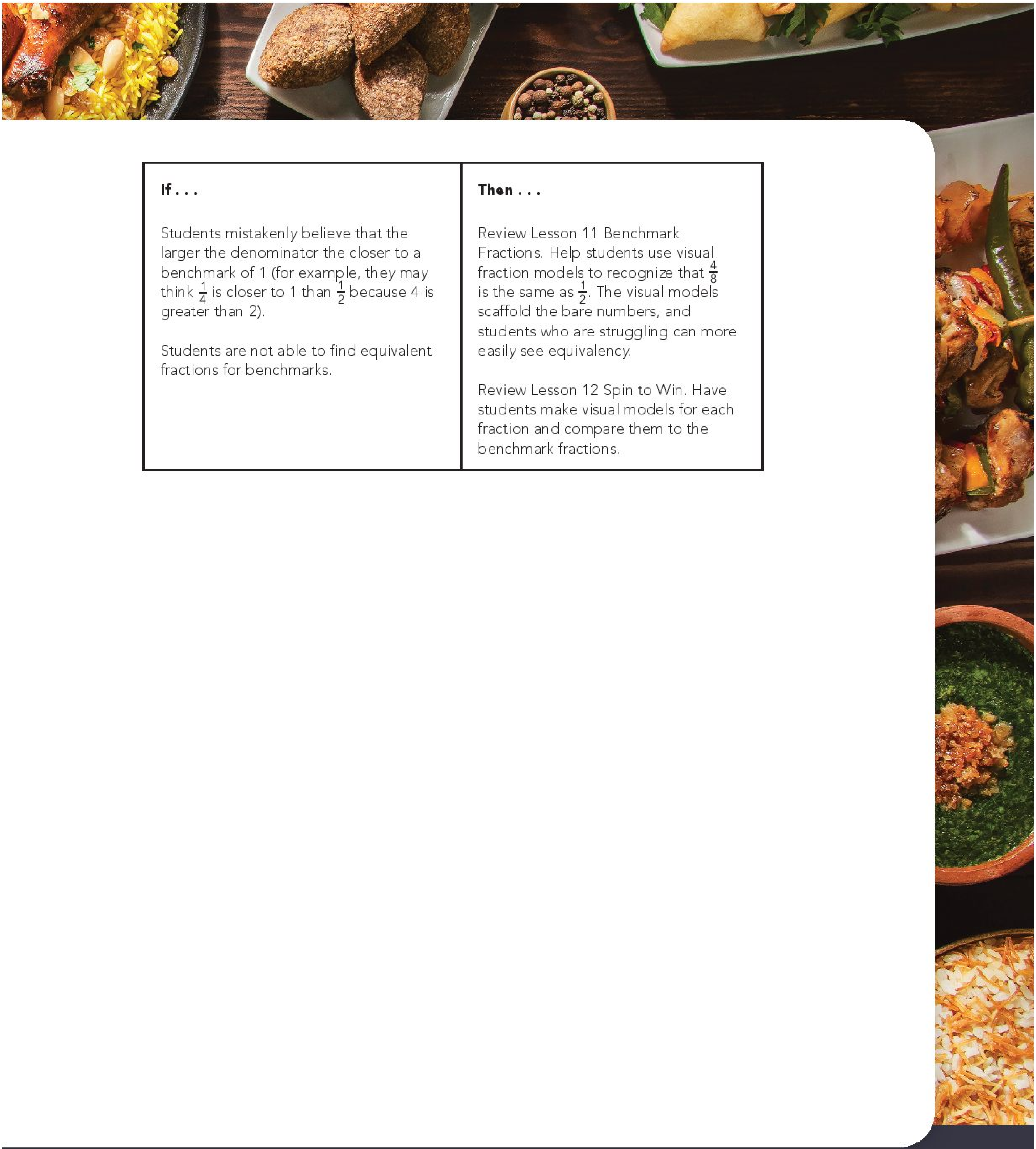
4.B.1.e Demonstrate understanding that fraction comparisons are valid only when the two fractions refer to the same whole.

Vocabulary Check-In

Review concept vocabulary as needed.

Remediation: Correcting Misconceptions

If . . . Students do not understand that when comparing fractions with like denominators, the fraction with the largest numerator is greater. Students do not understand that when comparing fractions with like numerators, the fractions with the smaller denominator is greater.	**Then . . .** Review Lesson 8 Like Denominators and Numerators. Have students practice comparing and ordering fractions with similar numerators and denominators using visual models.
If . . . Students do not understand that $\frac{1}{2}$ of one whole or set is not the same size as $\frac{1}{2}$ of another whole or set if the wholes or sets are not the same size.	**Then . . .** Review Lesson 9 CONNECT and pose similar problems. Consider giving students two different wholes, such as a large square and a small square or a circle and square and cut the shapes $\frac{1}{2}$ and compare. Repeat with other fractions.
If . . . Students think that if the denominators are different, the fractions cannot be equivalent.	**Then . . .** Review Lesson 9 What Is Equivalent. Have students repeat with a variety of fractions, first shading in a stated fraction and then dividing into more parts to show an equivalent part. Review Lesson 10 Domino Fun. Provide multiple visual models of equivalent fractions and provide practice for students to change a given visual model into an equivalent fraction model highlighting that both the numerator and denominator increase/decrease. Use the fraction wall visual model to help students see equivalence.



If . . .	**Then . . .**
Students mistakenly believe that the larger the denominator the closer to a benchmark of 1 (for example, they may think $\frac{1}{4}$ is closer to 1 than $\frac{1}{2}$ because 4 is greater than 2).	Review Lesson 11 Benchmark Fractions. Help students use visual fraction models to recognize that $\frac{4}{8}$ is the same as $\frac{1}{2}$. The visual models scaffold the bare numbers, and students who are struggling can more easily see equivalency.
Students are not able to find equivalent fractions for benchmarks.	Review Lesson 12 Spin to Win. Have students make visual models for each fraction and compare them to the benchmark fractions.

CONCEPT

3

Multiplication and Fractions

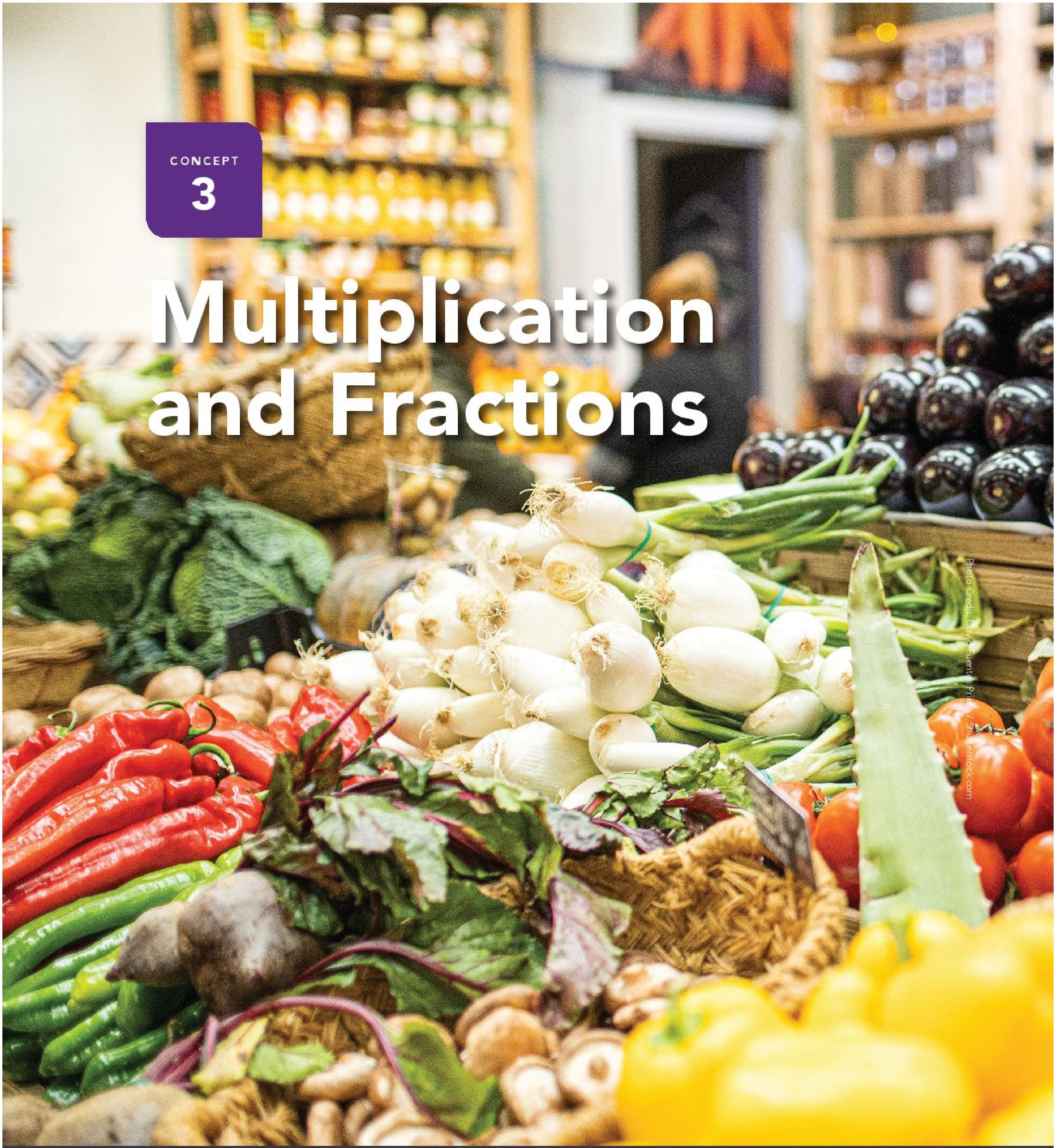
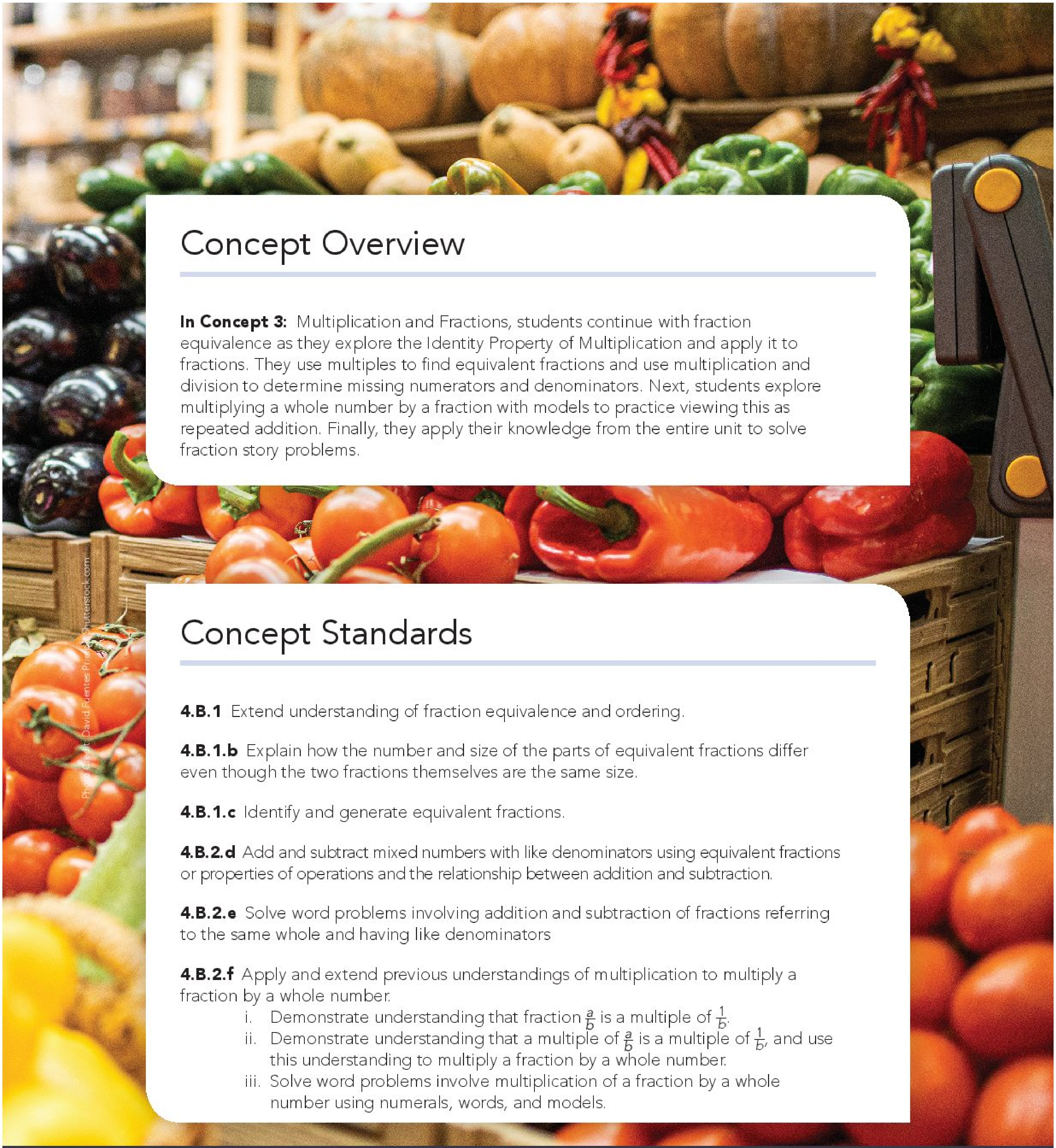


Photo Credit: David Fuentes Prieto / Shutterstock.com



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Concept Overview

In Concept 3: Multiplication and Fractions, students continue with fraction equivalence as they explore the Identity Property of Multiplication and apply it to fractions. They use multiples to find equivalent fractions and use multiplication and division to determine missing numerators and denominators. Next, students explore multiplying a whole number by a fraction with models to practice viewing this as repeated addition. Finally, they apply their knowledge from the entire unit to solve fraction story problems.

Concept Standards

4.B.1 Extend understanding of fraction equivalence and ordering.

4.B.1.b Explain how the number and size of the parts of equivalent fractions differ even though the two fractions themselves are the same size.

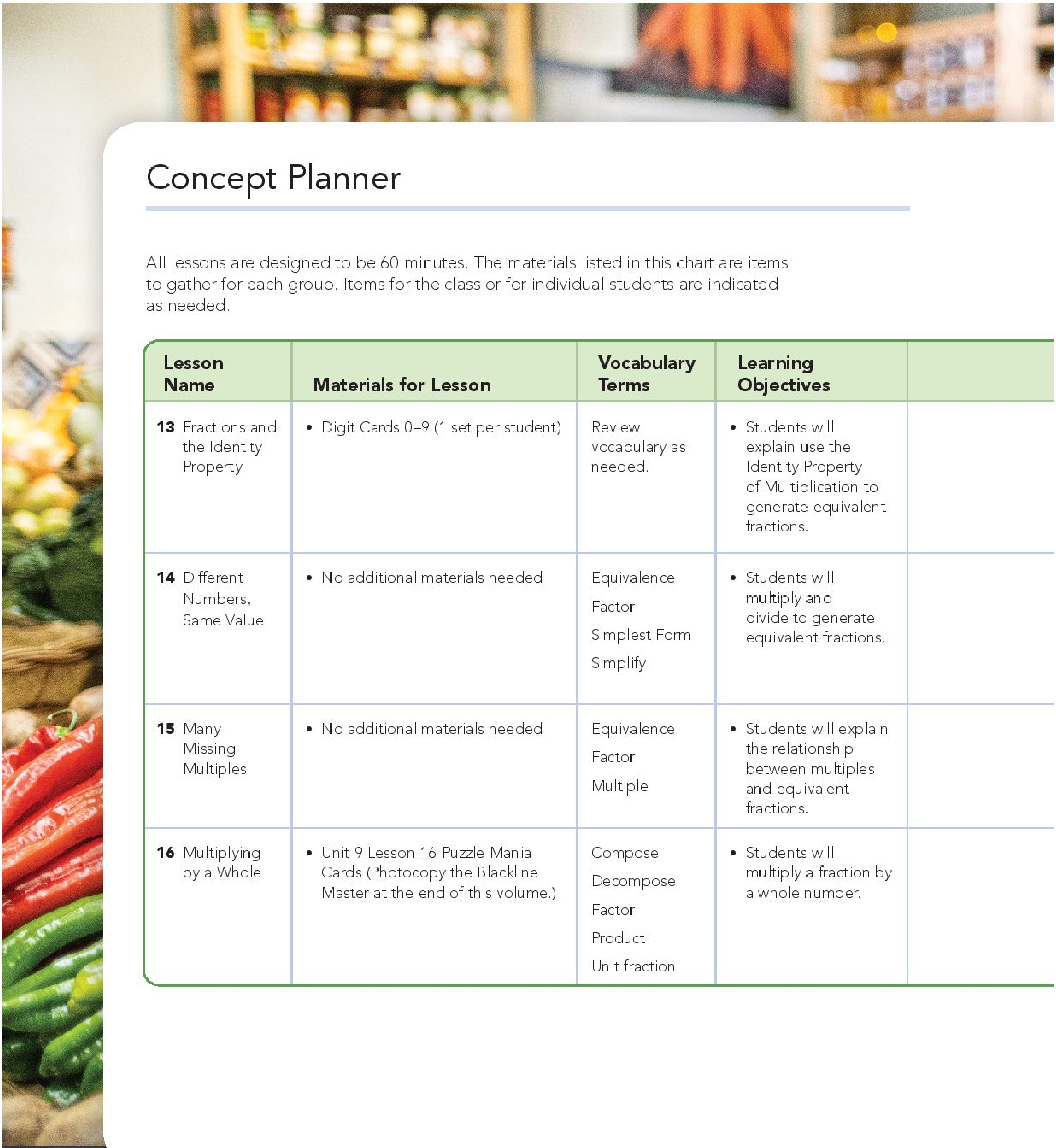
4.B.1.c Identify and generate equivalent fractions.

4.B.2.d Add and subtract mixed numbers with like denominators using equivalent fractions or properties of operations and the relationship between addition and subtraction.

4.B.2.e Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators

4.B.2.f Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.

- i. Demonstrate understanding that fraction $\frac{a}{b}$ is a multiple of $\frac{1}{b}$.
- ii. Demonstrate understanding that a multiple of $\frac{a}{b}$ is a multiple of $\frac{1}{b}$, and use this understanding to multiply a fraction by a whole number.
- iii. Solve word problems involve multiplication of a fraction by a whole number using numerals, words, and models.

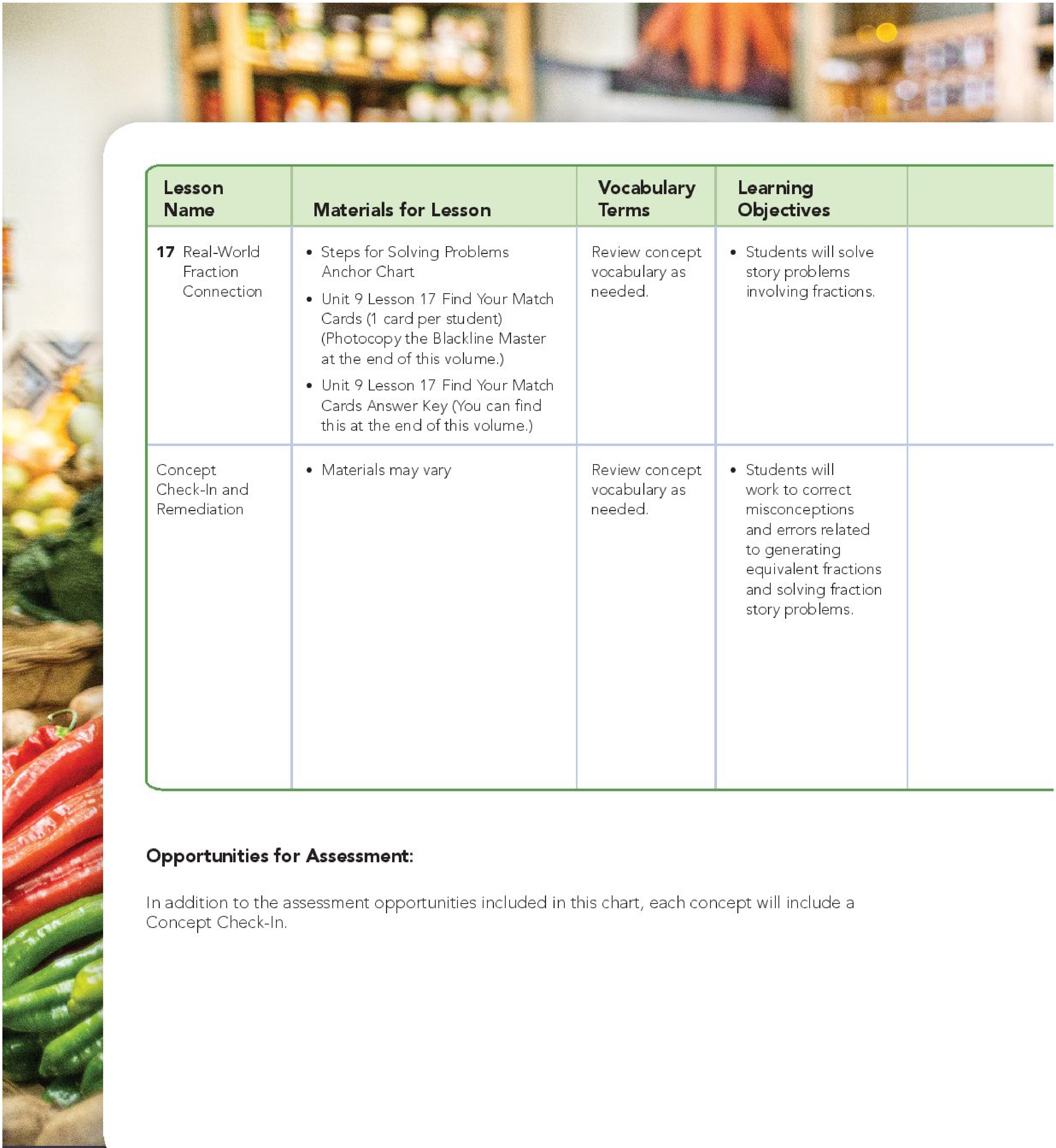


Concept Planner

All lessons are designed to be 60 minutes. The materials listed in this chart are items to gather for each group. Items for the class or for individual students are indicated as needed.

Lesson Name	Materials for Lesson	Vocabulary Terms	Learning Objectives	
13 Fractions and the Identity Property	• Digit Cards 0–9 (1 set per student)	Review vocabulary as needed.	• Students will explain use the Identity Property of Multiplication to generate equivalent fractions.	
14 Different Numbers, Same Value	• No additional materials needed	Equivalence Factor Simplest Form Simplify	• Students will multiply and divide to generate equivalent fractions.	
15 Many Missing Multiples	• No additional materials needed	Equivalence Factor Multiple	• Students will explain the relationship between multiples and equivalent fractions.	
16 Multiplying by a Whole	• Unit 9 Lesson 16 Puzzle Mania Cards (Photocopy the Blackline Master at the end of this volume.)	Compose Decompose Factor Product Unit fraction	• Students will multiply a fraction by a whole number.	

	Common Misconceptions and Errors	Opportunities for Formative Assessment
	• Students often believe that performing an operation always changes the value of the original quantity, even when multiplying or dividing by 1 with whole numbers and fractions. • Students may not understand that any fraction in $\frac{b}{b}$ form is equal to 1.	From Parts to a Whole, Riddle Me This, Practice, Check Your Understanding
	• Students often believe that performing an operation always changes the value of the original quantity, even when multiplying or dividing by 1 with whole numbers and fractions. • Students may not understand that any fraction in $\frac{b}{b}$ form is equal to 1.	Error Analysis, Multiplying to Create Equivalent Fractions, Dividing to Create Equivalent Fractions, Omar's Om Ali, Practice, Check Your Understanding
	• Students may not increase the numerator and the denominator by the same factor or only increase or decrease the denominator, not understanding that equivalence is about representing the same quantity.	Which Is Not a Multiple?, What Is the Missing Multiple, Nadia's Cake, Practice, Check Your Understanding
	• When multiplying fractions by a whole number, students may multiply the numerator and denominator (similar to multiplying to make equivalent fractions) rather than recognizing that a whole number, x, is represented in a fractional way as $\frac{x}{1}$.	Same Answer, Different Operation, Writing About Math, Practice, Check Your Understanding



Lesson Name	Materials for Lesson	Vocabulary Terms	Learning Objectives	
17 Real-World Fraction Connection	• Steps for Solving Problems Anchor Chart • Unit 9 Lesson 17 Find Your Match Cards (1 card per student) (Photocopy the Blackline Master at the end of this volume.) • Unit 9 Lesson 17 Find Your Match Cards Answer Key (You can find this at the end of this volume.)	Review concept vocabulary as needed.	• Students will solve story problems involving fractions.	
Concept Check-In and Remediation	• Materials may vary	Review concept vocabulary as needed.	• Students will work to correct misconceptions and errors related to generating equivalent fractions and solving fraction story problems.	

Opportunities for Assessment:

In addition to the assessment opportunities included in this chart, each concept will include a Concept Check-In.

	Common Misconceptions and Errors	Opportunities for Formative Assessment
	• When adding fractions, students may generalize the procedure for multiplication of fractions by adding the numerators and adding the denominators.	Fraction Story Problems, Create Your Own Problem, Practice, Check Your Understanding
	• Students often believe that performing an operation always changes the value of the original quantity, even when multiplying or dividing by 1 with whole numbers and fractions. • Students may not understand that any fraction in $\frac{b}{b}$ form is equal to 1. • Students may not increase the numerator and the denominator by the same factor or only increase or decrease the denominator, not understanding that equivalence is about representing the same quantity. • When multiplying fractions by a whole number, students may multiply the numerator and denominator (similar to multiplying to make equivalent fractions) rather than recognizing that a whole number, x, is represented in a fractional way as $\frac{x}{1}$.	

LESSON 13
Fractions and the Identity Property

Lesson Overview

In this lesson, students learn how to use the Identity Property of Multiplication to create equivalent fractions. They begin with a quick review of the Identity Property with whole numbers and with $\frac{1}{1}$. Then, students use a fraction table to visually review how many fractional parts make a whole for specific fractions and how to express them in fractional form. Students learn that when fractions are multiplied by different forms of $\frac{b}{b}$ the digits in the fraction change, but the value stays the same. Students then create equivalent fractions and place them on a number line.

Lesson Essential Questions

- What strategies can I use to find equivalent fractions?
- How do properties of multiplication of whole numbers apply to fractions?

Learning Objective

In this lesson

- Students will use the Identity Property of Multiplication to generate equivalent fractions.

Grade-Level Standards

4.B.1.a Explain cases of fraction equivalency by using visual fraction models.

4.B.1.b Explain how the number and size of the parts of equivalent fractions differ even though the two fractions themselves are the same size.

4.B.1.c Identify and generate equivalent fractions.

Vocabulary Check-In

Review vocabulary as needed.

Materials List

- Digit Cards 0–9 (1 set per student)

Preparation

- Photocopy the Blackline Master at the end of this volume.

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DIGITAL

Lesson 13
Fractions and the Identity Property

Quick Code:
egmt4114

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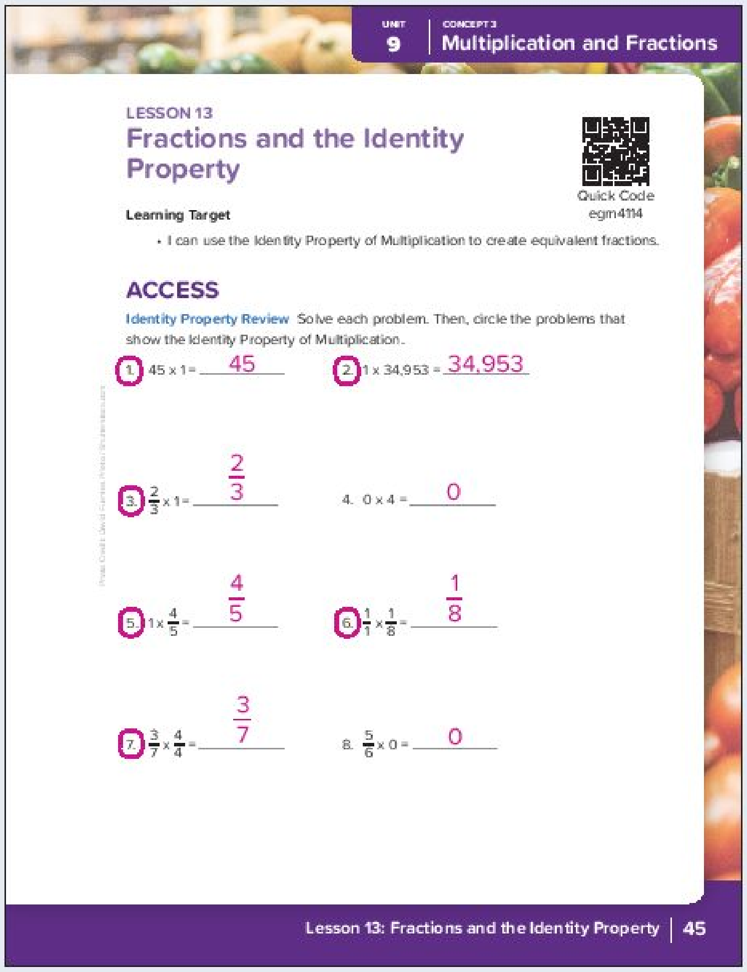
Student Page 45



UNIT 9 | CONCEPT 3 Multiplication and Fractions

LESSON 13

Fractions and the Identity Property

Quick Code egm4114

Learning Target

- I can use the Identity Property of Multiplication to create equivalent fractions.

ACCESS

Identity Property Review Solve each problem. Then, circle the problems that show the Identity Property of Multiplication.

① $45 \times 1 =$ 45

② $1 \times 34{,}953 =$ 34,953

③ $\frac{2}{3} \times 1 =$ $\frac{2}{3}$

4. $0 \times 4 =$ 0

⑤ $1 \times \frac{4}{5} =$ $\frac{4}{5}$

⑥ $\frac{1}{1} \times \frac{1}{8} =$ $\frac{1}{8}$

⑦ $\frac{3}{7} \times \frac{4}{4} =$ $\frac{3}{7}$

8. $\frac{5}{6} \times 0 =$ 0

Lesson 13: Fractions and the Identity Property | 45

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students often believe that performing an operation always changes the value of the original quantity, even when multiplying or dividing by 1 with whole numbers and fractions.
- Students may not understand that any fraction in $\frac{b}{b}$ form is equal to 1.

Identity Property Review

1. Direct students to Lesson 13 ACCESS Identity Property Review. Give students a few minutes to solve the problems and circle the ones that model the Identity Property of Multiplication.
2. Ask students to talk with their Shoulder Partner about any patterns they noticed. Encourage students to think about the meaning of these problems and what they would look like if they drew them.
3. Ask volunteers to explain the Identity Property of Multiplication. Then, go over the answers together.
4. Ask students to explain why multiplying a fraction by $\frac{1}{1}$ or $\frac{4}{4}$ is the same thing as multiplying a fraction by 1. Based on their prior learning in this unit, students should recognize that $\frac{1}{1}$ and $\frac{4}{4}$ are equal to 1.

BUILD (40 min)

From Parts to a Whole (15 min)

1. Direct students to Lesson 13 BUILD From Parts to a Whole. Ask students to use the fraction wall to solve the problems.
2. Give students 5–7 minutes to solve the problems (independently or with a partner).
3. Go over the answers together. Ask students to share their thinking.

Answer Key to From Parts to a Whole:

1. 2; $\frac{2}{2}$
2. 4; $\frac{4}{4}$
3. 10; $\frac{10}{10}$
4. Students should know that when the numerator and denominator are the same, the fraction is equivalent to 1 whole.
5. 25

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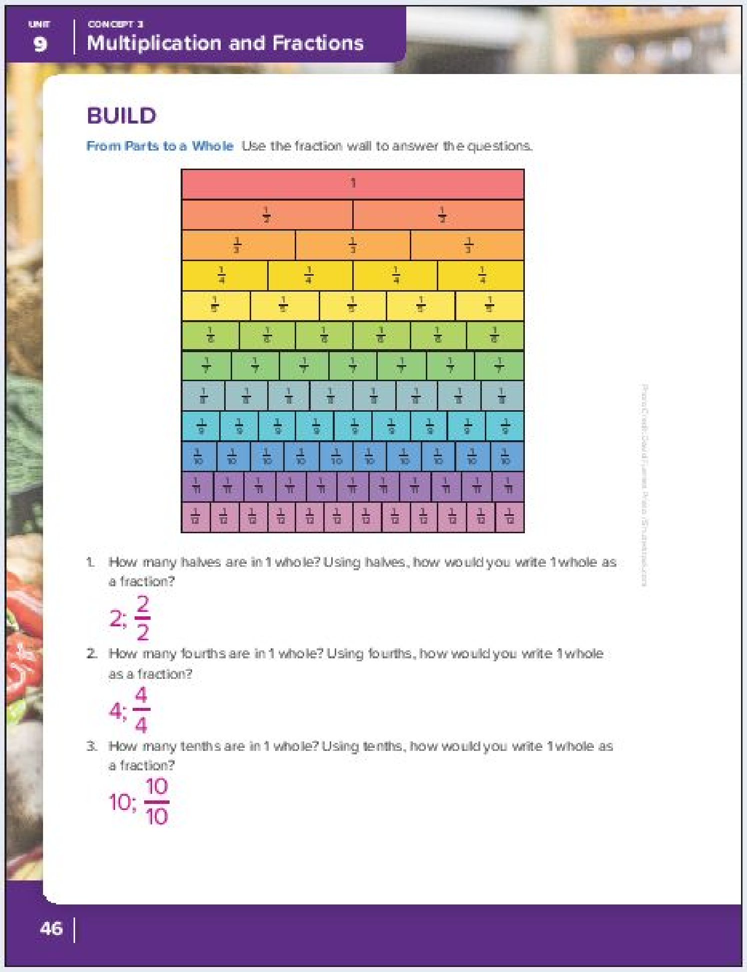
Student Page 46



UNIT 9 | CONCEPT 3 Multiplication and Fractions

BUILD

From Parts to a Whole Use the fraction wall to answer the questions.

1
$\frac{1}{2}$ $\frac{1}{2}$
$\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$
$\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$
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1. How many halves are in 1 whole? Using halves, how would you write 1 whole as a fraction?
   2; $\frac{2}{2}$
2. How many fourths are in 1 whole? Using fourths, how would you write 1 whole as a fraction?
   4; $\frac{4}{4}$
3. How many tenths are in 1 whole? Using tenths, how would you write 1 whole as a fraction?
   10; $\frac{10}{10}$

46

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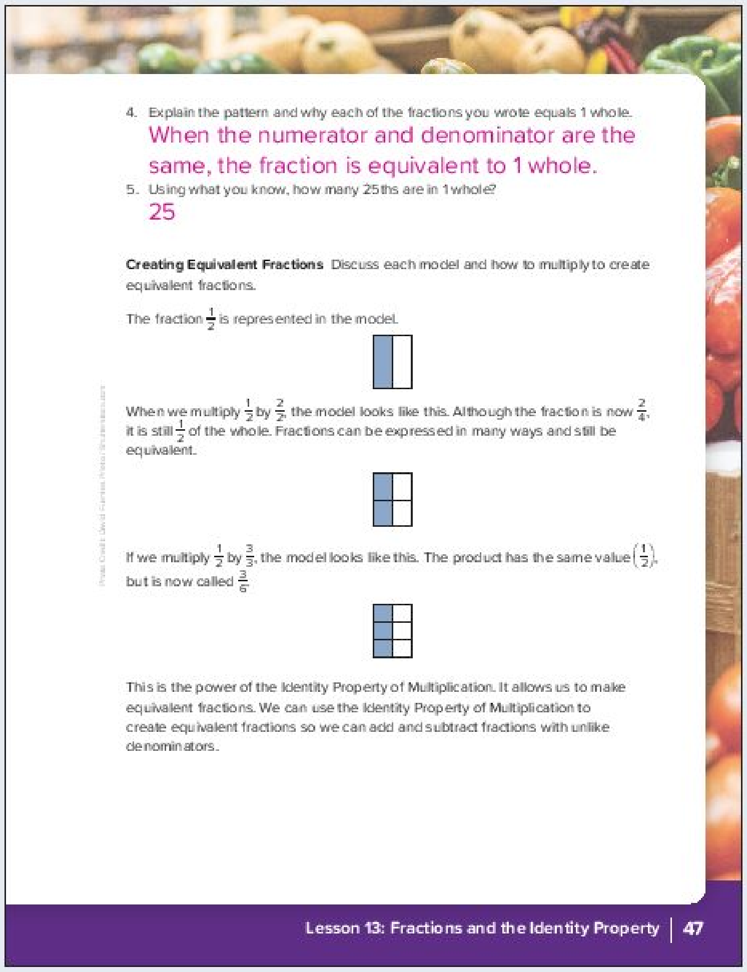
Student Page 47



4. Explain the pattern and why each of the fractions you wrote equals 1 whole.
   When the numerator and denominator are the same, the fraction is equivalent to 1 whole.
5. Using what you know, how many 25ths are in 1 whole?
   25

Creating Equivalent Fractions Discuss each model and how to multiply to create equivalent fractions.

The fraction $\frac{1}{2}$ is represented in the model.

When we multiply $\frac{1}{2}$ by $\frac{2}{2}$, the model looks like this. Although the fraction is now $\frac{2}{4}$, it is still $\frac{1}{2}$ of the whole. Fractions can be expressed in many ways and still be equivalent.

If we multiply $\frac{1}{2}$ by $\frac{3}{3}$, the model looks like this. The product has the same value $\left(\frac{1}{2}\right)$, but is now called $\frac{3}{6}$.

This is the power of the Identity Property of Multiplication. It allows us to make equivalent fractions. We can use the Identity Property of Multiplication to create equivalent fractions so we can add and subtract fractions with unlike denominators.

Lesson 13: Fractions and the Identity Property | 47

Creating Equivalent Fractions (10 min)

1. Explain to students that multiplying fractions is different from adding and subtracting fractions because both the numerator and the denominator change. Write $\frac{1}{2} \times \frac{2}{2}$ on the board. Model how to multiply the numerators to get the new numerator (2). Model how to multiply the denominators to get the new denominators (4).
2. Ask students to discuss what they observe about the product.
   Students should recognize that it is equivalent to $\frac{1}{2}$ because they multiplied by $\frac{2}{2}$, or 1.
3. Ask students to turn to Lesson 13 BUILD Creating Equivalent Fractions. Go through Creating Equivalent Fractions with students. Check their understanding as they discuss the examples in the Student Materials.

Equivalent to 1 (10 min)

1. Ask students to take out their Digit Cards (0–9). They will need cards 1–9. Explain how to do the activity.

   Directions:

   - Shuffle cards and place them face down in a pile.
   - To complete Problem 1, draw 1 card from the pile. Use the card to create a fractional 1. For example, if you draw a 7, write the 1 as $\frac{7}{7}$.
   - Multiply this fraction by the fractions listed in Problem 1.
   - Label the equivalent fraction above the benchmark fraction on the number line.
   - Repeat the process for Problems 2–5. Solve as many problems as possible.

2. In the last 5 minutes of BUILD, ask students to share their observations about the Hands-On Activity. Answer any questions students have about the activity, and help them clear up any lingering misconceptions or confusion. Remind students that the fractions they created in each problem have the same value but are expressed using different numbers.

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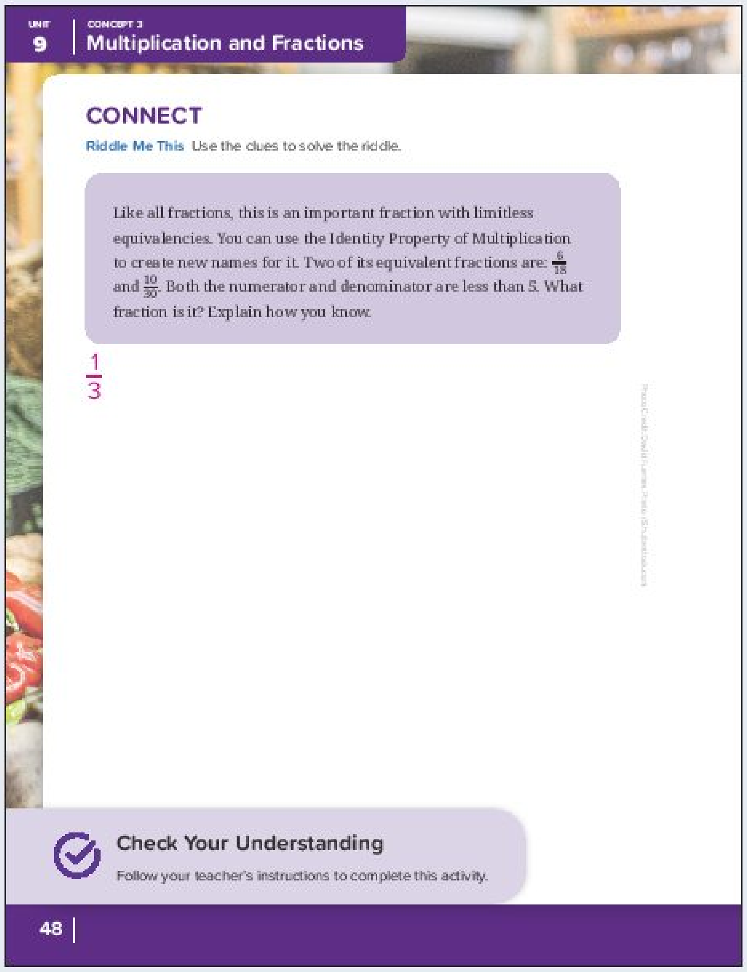
Student Page 48



UNIT 9 | CONCEPT 3 Multiplication and Fractions

CONNECT

Riddle Me This Use the clues to solve the riddle.

Like all fractions, this is an important fraction with limitless equivalencies. You can use the Identity Property of Multiplication to create new names for it. Two of its equivalent fractions are: $\frac{6}{18}$ and $\frac{10}{30}$. Both the numerator and denominator are less than 5. What fraction is it? Explain how you know.

$\frac{1}{3}$

Check Your Understanding

Follow your teacher's instructions to complete this activity.

48

CONNECT (7 min)

Riddle Me This

Ask students to turn to Lesson 13 CONNECT Riddle Me This and solve the riddle.

TEACHER NOTE: This activity may be challenging for some students. They may not yet make the connection that they can use the relationship between the numerator and denominator to find a smaller equivalent fraction. This activity sets the stage for the next lesson.

Answer Key for Riddle Me This:

$\frac{1}{3}$. Accept all reasonable answers for how students found $\frac{1}{3}$.

WRAP-UP (3 min)

Let's Chat About Our Learning

Ask volunteers to share their responses to Riddle Me This. Encourage students to ask each other questions and to share their problem-solving strategies. Take note of students who are struggling with the lesson concepts.

PRACTICE

Direct students to Lesson 13 PRACTICE and have them complete the problems. Address student errors and misconceptions around using the Identity Property of Multiplication to create equivalent fractions.

Check Your Understanding

1. $\frac{4}{5} \times \frac{10}{10} = \frac{40}{50}$ (or $\frac{4}{5}$)
2. $\frac{2}{9} \times \frac{6}{6} = \frac{12}{54}$ (or $\frac{2}{9}$)
3. $\frac{3}{8} \times \frac{5}{5} = \frac{15}{40}$ (or $\frac{3}{8}$)
4. Use the Identity Property of Multiplication to find 3 equivalent fractions for $\frac{3}{5}$.

   Answers will vary. Sample answers include $\frac{6}{10}$, $\frac{9}{15}$, $\frac{12}{20}$, $\frac{15}{25}$, and so on.

LESSON 14

Different Numbers, Same Value

Lesson Overview

In this lesson, students begin by looking at an error analysis problem in which a student mistakenly added instead of multiplying to create an equivalent fraction. Students use multiplication and division to determine whether fractions are equivalent. They create multiple equivalent fractions and find the simplest form of a fraction.

Lesson Essential Questions

- What strategies can I use to find equivalent fractions?
- How do properties of multiplication of whole numbers apply to fractions?

Learning Objective

In this lesson

- Students will multiply and divide to generate equivalent fractions.

Grade-Level Standards

4.B.1.a Extend understanding of fraction equivalence and ordering.

4.B.1.b Explain how the number and size of the parts of equivalent fractions differ even though the two fractions themselves are the same size.

4.B.1.c Identify and generate equivalent fractions.

Vocabulary Check-In

equivalence, factor, simplest form, simplify

Materials List

- No additional materials needed

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DIGITAL

Lesson 14

Different Numbers, Same Value

Quick Code:
egmt4115

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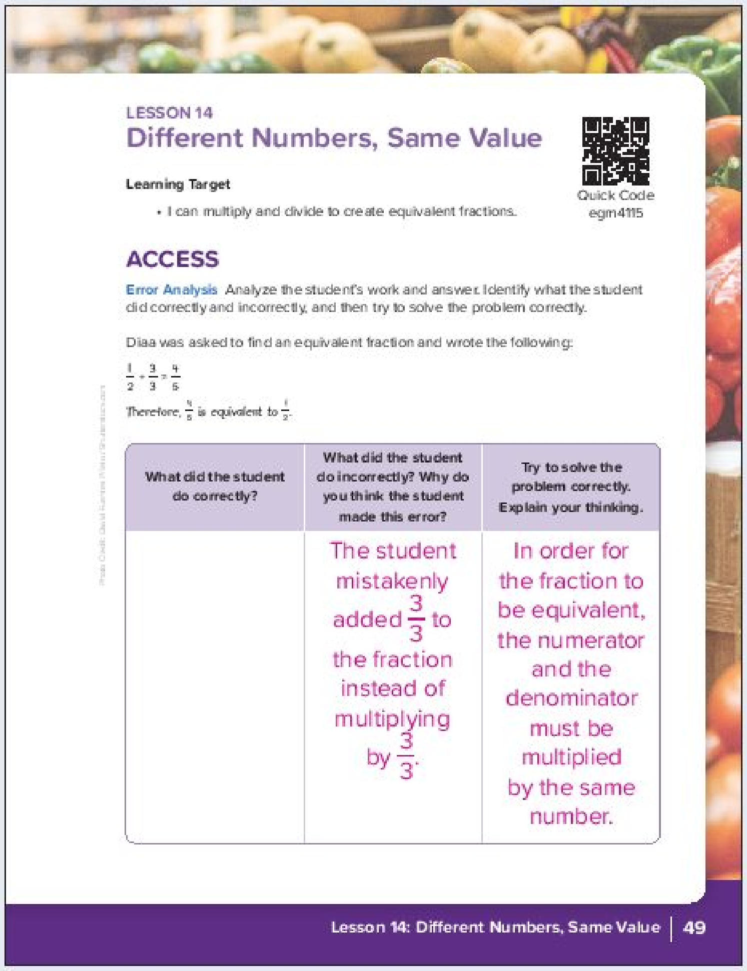
Student Page 49



LESSON 14

Different Numbers, Same Value

Learning Target

- I can multiply and divide to create equivalent fractions.

Quick Code
egm4115

ACCESS

Error Analysis Analyze the student's work and answer. Identify what the student did correctly and incorrectly, and then try to solve the problem correctly.

Diaa was asked to find an equivalent fraction and wrote the following:

$\frac{1}{2} + \frac{3}{3} = \frac{4}{5}$

Therefore, $\frac{4}{5}$ *is equivalent to* $\frac{1}{2}$.

What did the student do correctly?	What did the student do incorrectly? Why do you think the student made this error?	Try to solve the problem correctly. Explain your thinking.
	The student mistakenly added $\frac{3}{3}$ to the fraction instead of multiplying by $\frac{3}{3}$.	In order for the fraction to be equivalent, the numerator and the denominator must be multiplied by the same number.

Lesson 14: Different Numbers, Same Value | 49

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students often believe that performing an operation always changes the value of the original quantity, even when multiplying or dividing by 1 with whole numbers and fractions.
- Students may not understand that any fraction in $\frac{b}{b}$ form is equal to 1.

Error Analysis

1. Ask students to turn to Lesson 14 ACCESS Error Analysis and complete the error analysis.
2. After a few minutes, review the answers to the error analysis problem.

Answer Key for Error Analysis:
Students should see that the student mistakenly added $\frac{3}{3}$ to the fraction instead of multiplying by $\frac{3}{3}$. In order for the fraction to be equivalent, the numerator and the denominator must be multiplied by the same number.

BUILD (40 min)

Multiplying to Create Equivalent Fractions (20 min)

1. Tell students that today's lesson will be focused on using multiplication and division to create equivalent fractions.
2. Ask students to turn to Lesson 14 BUILD Multiplying to Create Equivalent Fractions. Once students are ready, have them quickly record as many fractions as possible that are equivalent to 1.
3. Use the Popcorn strategy to have students quickly share their ideas. Record several answers on the board. Ensure all students understand that for a fraction to be equivalent to 1, the numerator and denominator must be the same.
4. Ask students to think quietly about what happens when we multiply any number, including a fraction, by 1, or by a fraction equivalent to 1.
   The product is the same as the factor. For example, $763 \times 1 = 763$; $\frac{2}{4} \times 1 = \frac{2}{4}$; $\frac{1}{3} \times \frac{2}{2} = \frac{2}{6}$. This last example is the most complex version since students must remember to multiply the numerator and the denominator.
5. Ask students to talk to their Shoulder Partner about how they could write multiple equivalent fractions for $\frac{1}{3}$.
6. Call on students to share their thinking with the class.
   We can multiply the numerator and the denominator by the same number over and over.
7. On the board write $\frac{1}{3} \times \frac{1}{1} = \frac{1}{3}$. Ask students what number we could use next to find the next equivalency. Suggested answer: $\frac{2}{2}$
8. Write $\frac{1}{3} \times \frac{2}{2} = \frac{4}{6}$ on the board. Ask students to talk to their Shoulder Partner about how to find the next equivalent fraction in order.
   Students should multiply $\frac{1}{3} \times \frac{3}{3}$ to get $\frac{3}{9}$ for the next equivalent fraction.
9. If students understand this process, ask them to work independently or with a partner to solve Problems 2–5. If they need more support, work with students to solve the problems.

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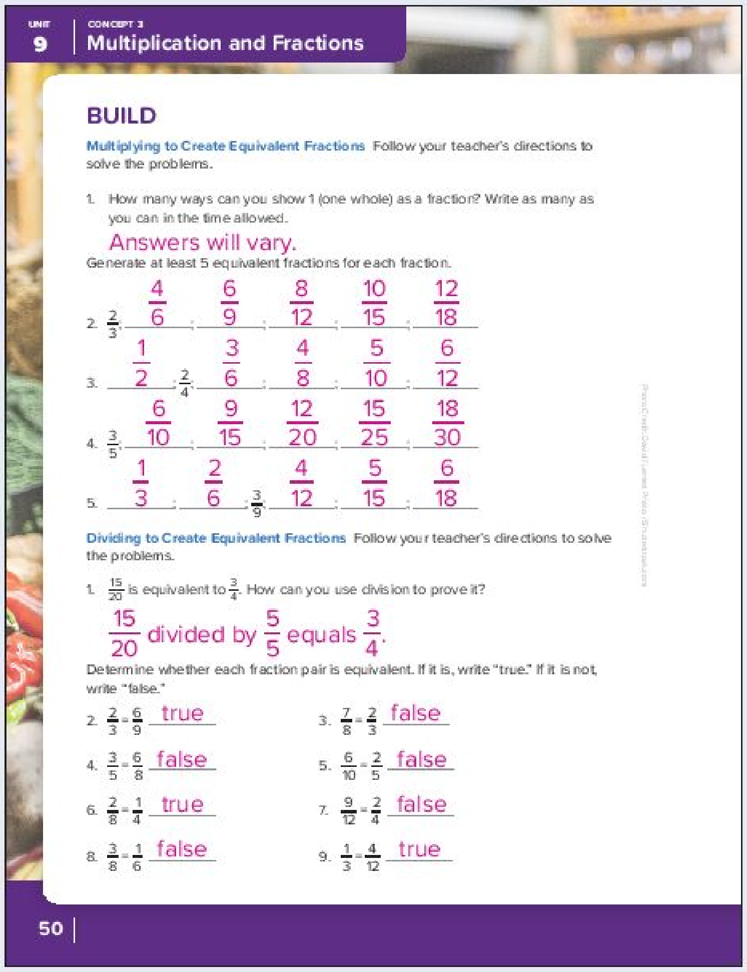
Student Page 50



UNIT 9 | CONCEPT 3 Multiplication and Fractions

BUILD

Multiplying to Create Equivalent Fractions Follow your teacher's directions to solve the problems.

1. How many ways can you show 1 (one whole) as a fraction? Write as many as you can in the time allowed.
   Answers will vary.

Generate at least 5 equivalent fractions for each fraction.

2. $\frac{2}{3}$: $\frac{4}{6}$; $\frac{6}{9}$; $\frac{8}{12}$; $\frac{10}{15}$; $\frac{12}{18}$
3. $\frac{1}{2}$; $\frac{2}{4}$; $\frac{3}{6}$; $\frac{4}{8}$; $\frac{5}{10}$; $\frac{6}{12}$
4. $\frac{3}{5}$: $\frac{6}{10}$; $\frac{9}{15}$; $\frac{12}{20}$; $\frac{15}{25}$; $\frac{18}{30}$
5. $\frac{1}{3}$; $\frac{2}{6}$; $\frac{3}{9}$; $\frac{4}{12}$; $\frac{5}{15}$; $\frac{6}{18}$

Dividing to Create Equivalent Fractions Follow your teacher's directions to solve the problems.

1. $\frac{15}{20}$ is equivalent to $\frac{3}{4}$. How can you use division to prove it?
   $\frac{15}{20}$ divided by $\frac{5}{5}$ equals $\frac{3}{4}$.

Determine whether each fraction pair is equivalent. If it is, write "true." If it is not, write "false."

2. $\frac{2}{3} = \frac{6}{9}$ true
3. $\frac{7}{8} = \frac{2}{3}$ false
4. $\frac{3}{5} = \frac{6}{8}$ false
5. $\frac{6}{10} = \frac{2}{5}$ false
6. $\frac{2}{8} = \frac{1}{4}$ true
7. $\frac{9}{12} = \frac{2}{4}$ false
8. $\frac{3}{8} = \frac{1}{6}$ false
9. $\frac{1}{3} = \frac{4}{12}$ true

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10. Use the last few minutes of this segment to go over the answers as a class. Ask the students if they created any type of system to help them solve these problems.

Dividing to Create Equivalent Fractions (20 min)

1. Introduce the terms *simplify* and *simplest terms*. Explain that *simplify* means to reduce a fraction to its simplest terms. A fraction is in simplest terms when the numerator and denominator have only one common factor: 1.

2. Ask students to discuss the following questions:

ASK

- *Does dividing by 1 (one whole) follow the same pattern as the Identity Property of Multiplication?*
  Yes

- *Who can prove it, showing your work on the board?*
  Sample response: $7 \div 1 = 7$

- *Does dividing by a fractional equivalent to 1 (one whole) follow the same pattern?*
  Yes

- *Who can prove it, showing your work on the board?*
  Sample response: $\frac{8}{4} \div \frac{2}{2} = \frac{4}{2}$

- *How can we use division to find equivalent fractions?*
  Since multiplication and division are inverse operations, we can use division to simplify a fraction, or find an equivalent fraction with a smaller numerator and a smaller denominator. Students do not need to specifically be able to simplify fractions. Rather, students need to be able to identify equivalency.

3. Ask students to turn to Lesson 14 BUILD Dividing to Create Equivalent Fractions and solve Problem 1. After a couple minutes, discuss the answer with students. Ask volunteers to share their thinking and work.

4. Ask students to complete Problems 2–9.

5. Use the last 5 minutes to have students share their answers and problem-solving strategies.

CONNECT (7 min)

Omar's Om Ali

Ask students to turn to Lesson 14 CONNECT Omar's Om Ali and answer the question.

WRAP-UP (3 min)

Let's Reflect on Our Learning

Ask students to reflect on their learning about fractions and do a Fist-to-Five to self-assess their progress to date. Ask volunteers to share their reasoning. Finally, ask students to identify strategies they can implement to help themselves overcome any challenges they are experiencing related to fractions.

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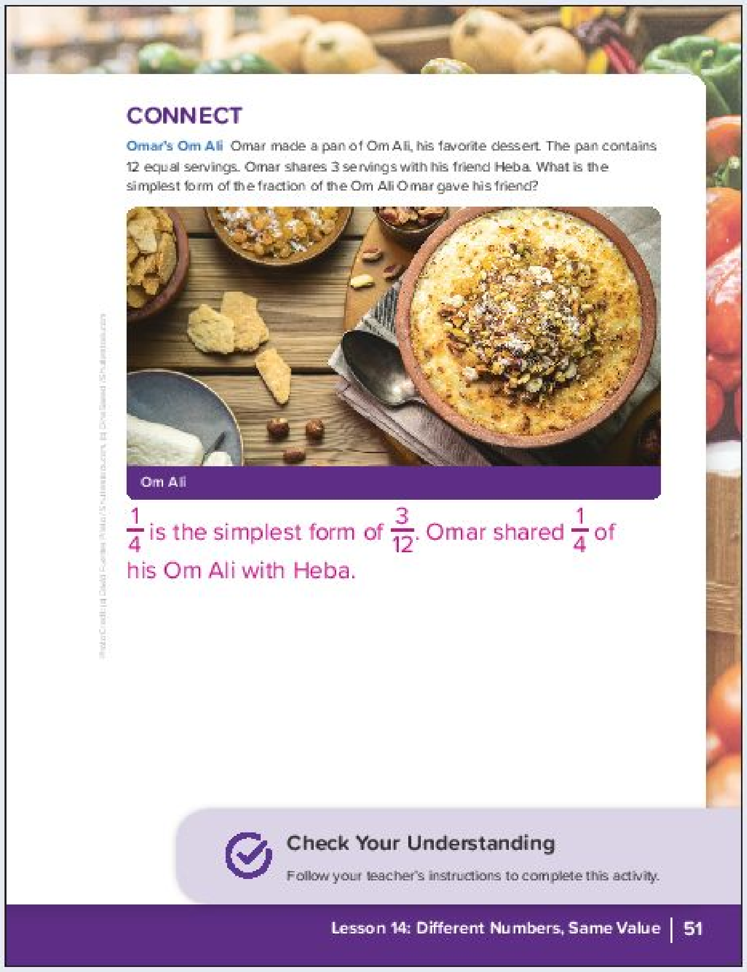
Student Page 51



CONNECT

Omar's Om Ali Omar made a pan of Om Ali, his favorite dessert. The pan contains 12 equal servings. Omar shares 3 servings with his friend Heba. What is the simplest form of the fraction of the Om Ali Omar gave his friend?

Om Ali

$\frac{1}{4}$ is the simplest form of $\frac{3}{12}$. Omar shared $\frac{1}{4}$ of his Om Ali with Heba.

Check Your Understanding

Follow your teacher's instructions to complete this activity.

Lesson 14: Different Numbers, Same Value | 51

PRACTICE

Direct students to Lesson 14 PRACTICE and have them complete the problems. Address student errors and misconceptions around multiplying and dividing to create equivalent fractions.

Check Your Understanding

Help the blue Sinai agama find his way home by coloring in all of the fractions that are equivalent to $\frac{2}{3}$.

$\frac{2}{3}$	$\frac{16}{20}$	$\frac{1}{3}$	$\frac{6}{12}$	$\frac{4}{5}$	$\frac{3}{5}$	$\frac{6}{8}$
$\frac{10}{15}$	$\frac{20}{30}$	$\frac{9}{20}$	$\frac{8}{11}$	$\frac{6}{7}$	$\frac{7}{9}$	$\frac{4}{10}$
$\frac{15}{23}$	$\frac{12}{18}$	$\frac{18}{27}$	$\frac{1}{2}$	$\frac{2}{4}$	$\frac{2}{5}$	$\frac{30}{40}$
$\frac{1}{2}$	$\frac{12}{14}$	$\frac{4}{6}$	$\frac{6}{10}$	$\frac{5}{15}$	$\frac{7}{8}$	$\frac{9}{10}$
$\frac{1}{6}$	$\frac{3}{6}$	$\frac{8}{12}$	$\frac{14}{21}$	$\frac{2}{3}$	$\frac{1}{4}$	$\frac{4}{9}$
$\frac{7}{9}$	$\frac{15}{24}$	$\frac{10}{14}$	$\frac{8}{10}$	$\frac{10}{15}$	$\frac{1}{9}$	$\frac{6}{8}$
$\frac{1}{10}$	$\frac{6}{12}$	$\frac{4}{8}$	$\frac{7}{14}$	$\frac{6}{9}$	$\frac{5}{18}$	$\frac{20}{25}$
$\frac{3}{5}$	$\frac{2}{8}$	$\frac{3}{8}$	$\frac{6}{18}$	$\frac{12}{18}$	$\frac{16}{23}$	$\frac{22}{33}$

LESSON 15
Many Missing Multiples

Lesson Overview

In this lesson, students review multiples and factors and apply that understanding, as well as their understanding of the Identity Property of Multiplication, to find missing numerators and denominators in equivalent fractions. They also solve story problems that involve finding equivalent fractions.

Lesson Essential Questions

- What strategies can I use to find equivalent fractions?
- How do properties of multiplication of whole numbers apply to fractions?

Learning Objective

In this lesson

- Students will explain the relationship between multiples and equivalent fractions.

Grade-Level Standards

4.B.1.c Identify and generate equivalent fractions.

4.C.2.a Demonstrate understanding that a whole number is a multiple of each of its factors.

4.C.2.b Find common multiples between two numbers.

Vocabulary Check-In

equivalence, factor, multiple

Materials List

- No additional materials needed

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Lesson 15

Many Missing Multiples

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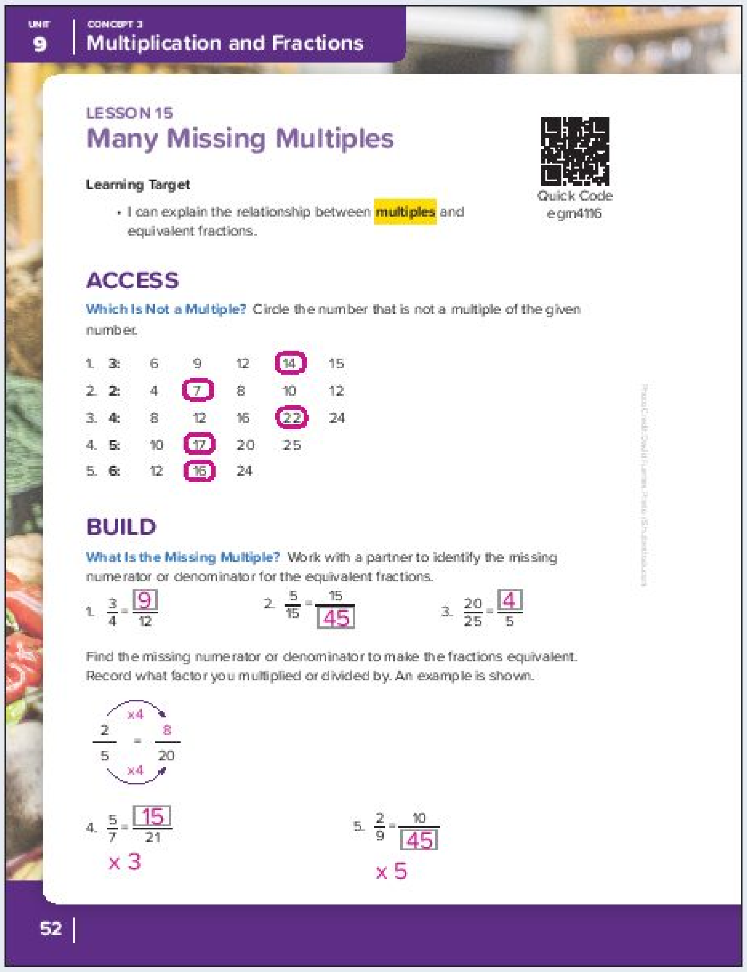
Student Page 52



UNIT 9 | CONCEPT 3
Multiplication and Fractions

LESSON 15
Many Missing Multiples

Learning Target

- I can explain the relationship between multiples and equivalent fractions.

Quick Code
egm4116

ACCESS

Which Is Not a Multiple? Circle the number that is not a multiple of the given number.

1. **3:** 6 9 12 14 15
2. **2:** 4 7 8 10 12
3. **4:** 8 12 16 22 24
4. **5:** 10 17 20 25
5. **6:** 12 16 24

BUILD

What Is the Missing Multiple? Work with a partner to identify the missing numerator or denominator for the equivalent fractions.

1. $\frac{3}{4} = \frac{\boxed{9}}{12}$
2. $\frac{5}{15} = \frac{15}{\boxed{45}}$
3. $\frac{20}{25} = \frac{\boxed{4}}{5}$

Find the missing numerator or denominator to make the fractions equivalent. Record what factor you multiplied or divided by. An example is shown.

$$\frac{2}{5} \overset{\times 4}{\underset{\times 4}{=}} \frac{8}{20}$$

4. $\frac{5}{7} = \frac{\boxed{15}}{21}$
   × 3
5. $\frac{2}{9} = \frac{10}{\boxed{45}}$
   × 5

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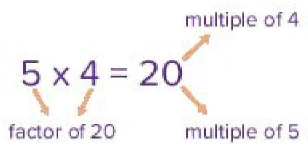
ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may not increase the numerator and the denominator by the same factor or only increase or decrease the denominator, not understanding that equivalence is about representing the same quantity.

Which Is Not a Multiple?

TEACHER NOTE: Understanding multiples and factors aids students as they think about finding equivalent fractions, as well as finding like denominators later. Students worked with multiples and factors in Unit 6.



1. Review with students the meaning of the terms multiple and factor from Unit 6.
2. Direct students to Lesson 15 Which Is Not a Multiple? Ask students to solve Problem 1 and give a Thumbs-Up when finished.
3. Use Calling Sticks to choose 1 or 2 students to explain why 14 is not a multiple of 3.
   Because it is not possible to multiply any whole number by 3 to get 14.
4. Ask students to complete Problems 2–5.
5. Ask students to discuss the following questions:

ASK

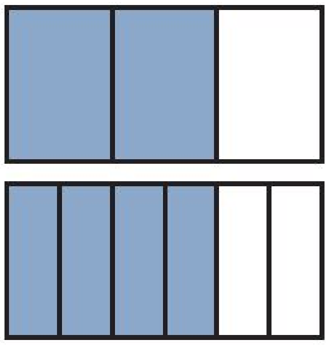
- *What numbers have similar multiples?*
  Accept any correct answers.
- *Why is 12 on all the lists but 5?*
  2, 3, 4 and 6 are factors of 12, so they are on all of the lists. 5 is not a factor of 12.
- *Can you think of a number that might be in all 5 lists?*
  Sample answers: 30, 60, 120

BUILD (40 min)

Many Multiples (15 min)

1. Explain that today, students will create more equivalent fractions. As they work, they should reflect on their learning so they are able to summarize it at the end of the lesson.
2. Ask students to recite the first four multiples of 2 and the first four multiples of 3. Record on the board.
   2, 4, 6, 8; 3, 6, 9, 12
3. Write $\frac{2}{3} = \frac{4}{6}$? Ask students to stand if they think $\frac{2}{3}$ and $\frac{4}{6}$ are equivalent.

   TEACHER NOTE: If students struggle to see equivalence, draw fraction models for $\frac{2}{3}$ and $\frac{4}{6}$ on the board.



4. Next, ask students to discuss the following questions:

ASK

- *What is the relationship between the numerator and the denominator in $\frac{2}{3}$ and $\frac{4}{6}$?*
  The numerator and the denominator both doubled.
- *How are the numerators and denominators similar to the multiples of 2 and 3?*
  $2 \times 2 = 4$ and $3 \times 2 = 6$. 4 and 6 are the second multiples in the list.

5. Remind students that $\frac{1}{1} = 1$ and the Identity Property of Multiplication tells us that $\frac{2}{3} \times 1 = \frac{2}{3}$. They also multiplied the numerator and denominator by 2 to find the second multiple of each number. Write the following on the board if necessary:

$$\frac{2}{3} \times \frac{1}{1} = \frac{2}{3} \qquad \frac{2}{3} \times \frac{2}{2} = \frac{4}{6}$$

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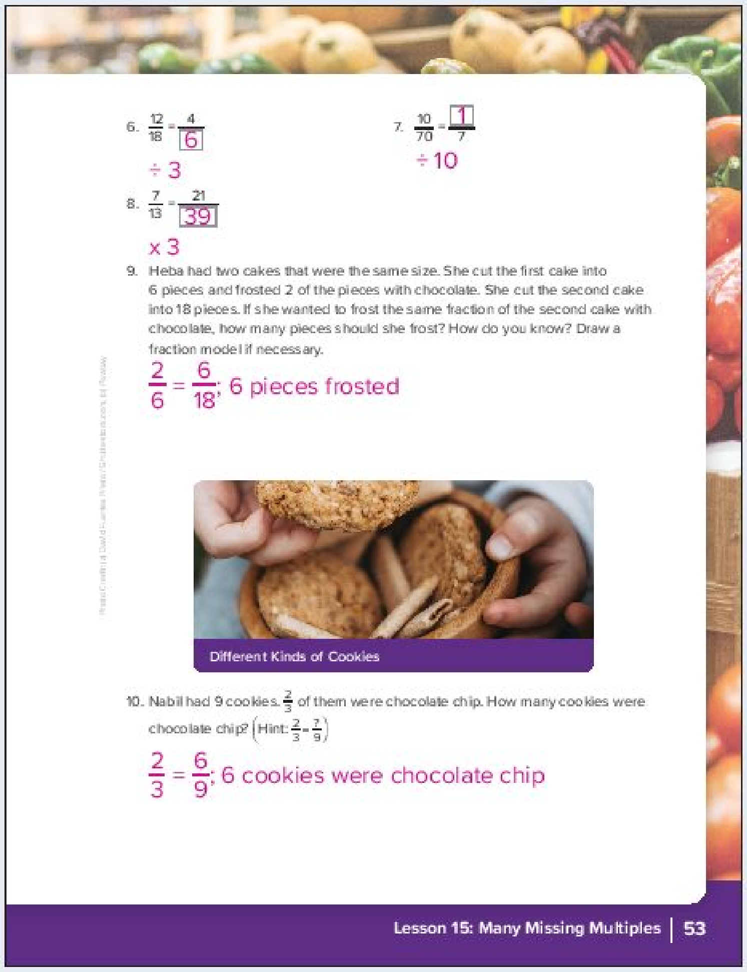
Student Page 53



6. $\frac{12}{18} = \frac{4}{\boxed{6}}$
   ÷ 3

7. $\frac{10}{70} = \frac{\boxed{1}}{7}$
   ÷ 10

8. $\frac{7}{13} = \frac{21}{\boxed{39}}$
   x 3

9. Heba had two cakes that were the same size. She cut the first cake into 6 pieces and frosted 2 of the pieces with chocolate. She cut the second cake into 18 pieces. If she wanted to frost the same fraction of the second cake with chocolate, how many pieces should she frost? How do you know? Draw a fraction model if necessary.
   $\frac{2}{6} = \frac{6}{18}$; 6 pieces frosted

Different Kinds of Cookies

10. Nabil had 9 cookies. $\frac{2}{3}$ of them were chocolate chip. How many cookies were chocolate chip? (Hint: $\frac{2}{3} = \frac{?}{9}$)
    $\frac{2}{3} = \frac{6}{9}$; 6 cookies were chocolate chip

Lesson 15: Many Missing Multiples | 53

6. Ask students to discuss the following questions:

ASK

- *Looking at the multiples for 2 and 3, can you determine another fraction that would be equivalent to* $\frac{2}{3}$ *and* $\frac{4}{6}$*?*
  $\frac{6}{9}, \frac{8}{12}$
- *Can you predict an equivalent fraction for* $\frac{4}{5}$ *thinking about what the second multiple of 4 and 5 is?*
  $\frac{8}{10}$

What Is the Missing Multiple? (25 min)

1. Ask students to turn to Lesson 15 BUILD What Is the Missing Multiple? and work with a partner to solve Problems 1–3.
2. After a few minutes, ask students to discuss how they solved the problems.
3. Reinforce again that understanding multiples can help us find the missing numerator and denominator. Draw arrows to show what was multiplied or divided, reminding students that the $\frac{3}{3} = 1$ and $\frac{5}{5} = 1$, so the value of the new fraction is equivalent.

$$\begin{tikzcd} \frac{3}{4} \arrow[r, phantom, "="] \arrow[r, bend left, "\times 3"] \arrow[r, bend right, "\times 3"'] & \frac{9}{12} \end{tikzcd} \qquad \begin{tikzcd} \frac{5}{15} \arrow[r, phantom, "="] \arrow[r, bend left, "\times 3"] \arrow[r, bend right, "\times 3"'] & \frac{15}{45} \end{tikzcd}$$

$$\frac{20}{25} = \frac{?}{?} = \frac{?}{5}$$

$$\frac{20}{25} \div \frac{5}{5} = \frac{4}{5}$$

4. Ask students to complete the remaining problems independently.
5. Use the last 5 minutes of BUILD to discuss any problems that were tricky. Pay close attention to the story problems, discussing how these are examples of finding equivalent fractions.

TEACHER NOTE: Based on the needs of your students, the Independent practice can be differentiated to be done with a partner or in a small group with teacher support.

CONNECT (7 min)

Nadia's Cake

Ask students to turn to Lesson 15 CONNECT Nadia's Cake and answer the questions.

Answer Key for Nadia's Cake:

1. $\frac{6}{12}$ (or $\frac{1}{2}$); 6 pieces
2. $\frac{4}{12}$ (or $\frac{1}{3}$); 4 pieces
3. $\frac{2}{12}$ (or $\frac{1}{6}$) of the cake is left over
4. $\frac{4}{24}$ (or $\frac{2}{12}$ if they answered $\frac{1}{6}$ for Problem 3)

TEACHER NOTE: Consider collecting students' books and using this learning activity as a formative assessment.

WRAP-UP (3 min)

Let's Chat About Our Learning

1. Ask students to discuss the Essential Questions:
   - What strategies can I use to find equivalent fractions?
   - How do properties of multiplication of whole numbers apply to fractions?
2. Encourage students to ask questions of each other to clarify misconceptions and misunderstandings. Answers will vary, but students should recall and discuss their learning over the past several lessons.

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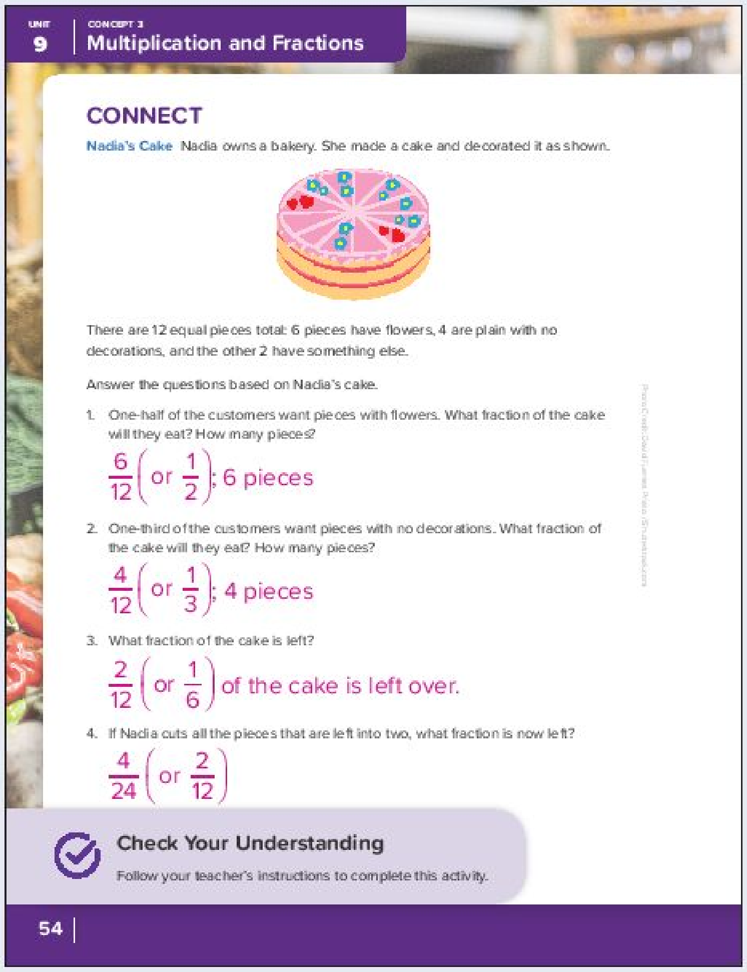

UNIT 9 | CONCEPT 3 Multiplication and Fractions

CONNECT

Nadia's Cake Nadia owns a bakery. She made a cake and decorated it as shown.

There are 12 equal pieces total: 6 pieces have flowers, 4 are plain with no decorations, and the other 2 have something else.

Answer the questions based on Nadia's cake.

1. One-half of the customers want pieces with flowers. What fraction of the cake will they eat? How many pieces?
   $\frac{6}{12}\left(\text{or } \frac{1}{2}\right)$; 6 pieces
2. One-third of the customers want pieces with no decorations. What fraction of the cake will they eat? How many pieces?
   $\frac{4}{12}\left(\text{or } \frac{1}{3}\right)$; 4 pieces
3. What fraction of the cake is left?
   $\frac{2}{12}\left(\text{or } \frac{1}{6}\right)$ of the cake is left over.
4. If Nadia cuts all the pieces that are left into two, what fraction is now left?
   $\frac{4}{24}\left(\text{or } \frac{2}{12}\right)$

Check Your Understanding

Follow your teacher's instructions to complete this activity.

54

PRACTICE

Direct students to Lesson 15 PRACTICE and have them complete the problems. Address student errors and misconceptions around equivalent fractions.

Check Your Understanding

Find the missing numerator or denominator and record the factor you multiplied or divided by to solve.

1. $\frac{1}{2} = \frac{3}{6}$ (× 3)
2. $\frac{4}{9} = \frac{48}{108}$ (× 12)
3. $\frac{100}{400} = \frac{1}{4}$ (÷ 100)
4. $\frac{36}{60} = \frac{12}{20}$ (÷ 3)
5. $\frac{14}{20} = \frac{56}{80}$ (× 4)

Solve the problems by finding an equivalent fraction.

6. Kamel has 12 goats. $\frac{2}{3}$ of them are black. How many are black? $\left(\frac{2}{3} = \frac{?}{12}\right)$

   $\frac{2}{3} = \frac{8}{12}$; 8 goats were black

7. Mona made 24 kahk to celebrate Eid al-Fitr. If $\frac{3}{4}$ of the kahk had walnuts, how many kahk had walnuts? $\left(\frac{3}{4} = \frac{?}{24}\right)$

   $\frac{3}{4} = \frac{18}{24}$; 18 kahk had walnuts

LESSON 16
Multiplying by a Whole

Lesson Overview

In this lesson, students learn how to multiply a fraction by a whole number. Students write the sum of unit fractions, model using bar models, and write equivalent multiplication sentences. Students also discuss why the product is smaller than a whole number, but larger than the fraction factor when we multiply a fraction by a whole number.

Lesson Essential Question

- How do properties of multiplication of whole numbers apply to fractions?

Learning Objective

In this lesson

- Students will multiply a fraction by a whole number.

Grade-Level Standard

4.B.2.f Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.

i. Demonstrate understanding that fraction $\frac{a}{b}$ is a multiple of $\frac{1}{b}$.

ii. Demonstrate understanding that a multiple of $\frac{a}{b}$ is a multiple of $\frac{1}{b}$, and use this understanding to multiply a fraction by a whole number.

iii. Solve word problems involving multiplication of a fraction by a whole number using numerals, words, and models.

Vocabulary Check-In

compose, decompose, factor, product, unit fraction

Materials List

- Unit 9 Lesson 16 Puzzle Mania Cards

Preparation

Photocopy the Blackline Master at the end of this volume.

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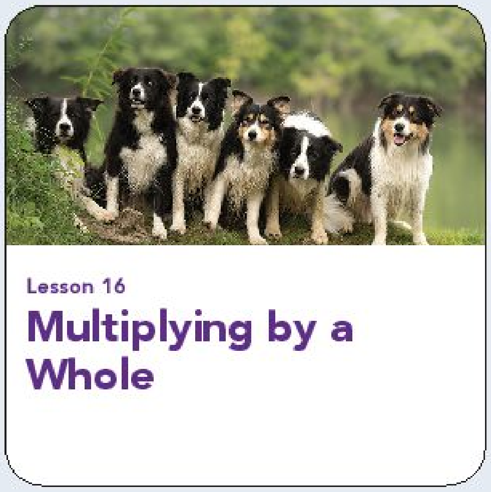

Lesson 16

Multiplying by a Whole

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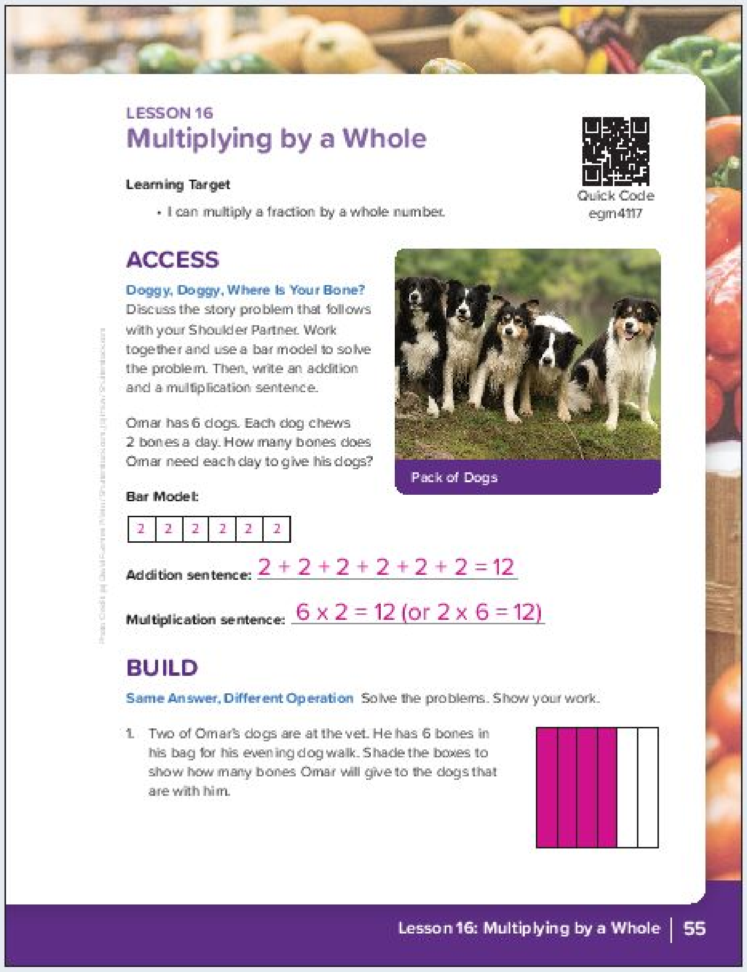

LESSON 16

Multiplying by a Whole

Quick Code
egm4117

Learning Target

- I can multiply a fraction by a whole number.

ACCESS

Doggy, Doggy, Where Is Your Bone? Discuss the story problem that follows with your Shoulder Partner. Work together and use a bar model to solve the problem. Then, write an addition and a multiplication sentence.

Omar has 6 dogs. Each dog chews 2 bones a day. How many bones does Omar need each day to give his dogs?

Pack of Dogs

Bar Model:

2	2	2	2	2	2

Addition sentence: 2 + 2 + 2 + 2 + 2 + 2 = 12

Multiplication sentence: 6 x 2 = 12 (or 2 x 6 = 12)

BUILD

Same Answer, Different Operation Solve the problems. Show your work.

1. Two of Omar's dogs are at the vet. He has 6 bones in his bag for his evening dog walk. Shade the boxes to show how many bones Omar will give to the dogs that are with him.

Lesson 16: Multiplying by a Whole | 55

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- When multiplying fractions by a whole number, students may multiply the numerator and denominator (similar to multiplying to make equivalent fractions) rather than recognizing that a whole number, *x*, is represented in a fractional way as $\frac{x}{1}$.

Doggy, Doggy, Where Is Your Bone?

1. Direct students to Lesson 16 ACCESS Doggy, Doggy, Where Is Your Bone? and ask them to discuss and solve the story problem with their Shoulder Partner.
2. After a few minutes, use Calling Sticks to choose students to share their answers and their problem-solving strategies.

Answer Key for Doggy, Doggy, Where Is Your Bone?

Bar model:	Addition sentence:	Multiplication sentence:
2 | 2 | 2 | 2 | 2 | 2	2 + 2 + 2 + 2 + 2 + 2 = 12	6 × 2 = 12 (or 2 × 6 = 12)

BUILD (40 min)

Same Answer, Different Operation

1. Ask students to turn to Lesson 16 BUILD Same Answer, Different Operation. Ask students to work independently or with a partner to solve Problems 1–3.
2. After a few minutes, go over the answers together.
3. Ask students to Think, Pair, Share about how they could turn the addition sentence into a multiplication sentence. Ask volunteers to share their thinking with the class.

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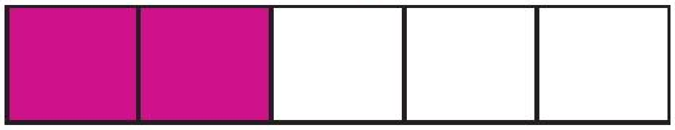
4. Ask students to record a multiplication sentence for Problem 4. Confirm the correct answer with students before moving on.
5. Ask students to work independently to solve Problems 5 and 6. At the end of this segment, go over the answers to Problems 5 and 6 with students.

Answer Key for Same Answer, Different Operation:

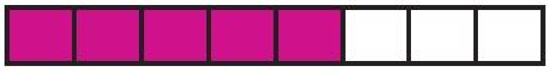
1. Students should shade 4 of the 6 boxes
2. $\frac{4}{6}$
3. $\frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}=\frac{4}{6}$
4. $4\times\frac{1}{6}=\frac{4}{6}$
5. Draw a bar model and write an addition and multiplication sentence for $\frac{2}{5}$.



$\frac{1}{5}+\frac{1}{5}=\frac{2}{5}$

$2\times\frac{1}{5}=\frac{2}{5}$

6. Draw a bar model and write an addition and multiplication sentence for $\frac{5}{8}$.



$\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}=\frac{5}{8}$

$5\times\frac{1}{8}=\frac{5}{8}$

Puzzle Mania (20 min)

TEACHER NOTE: Decide in advance how you will group students for the hands-on activity. There are 32 puzzle pieces. If your class has fewer than 32 students, some students may have more than 1 puzzle piece. If your class has more than 32 students, you may pair up your some or all of your students. Alternative game play: Print out a set for each group and have students answer all of the questions in a sorting activity

1. Distribute the Puzzle Mania Cards.
2. Explain that the puzzle pieces contain either a fraction, a model, a repeated addition sentence, or a multiplication sentence.

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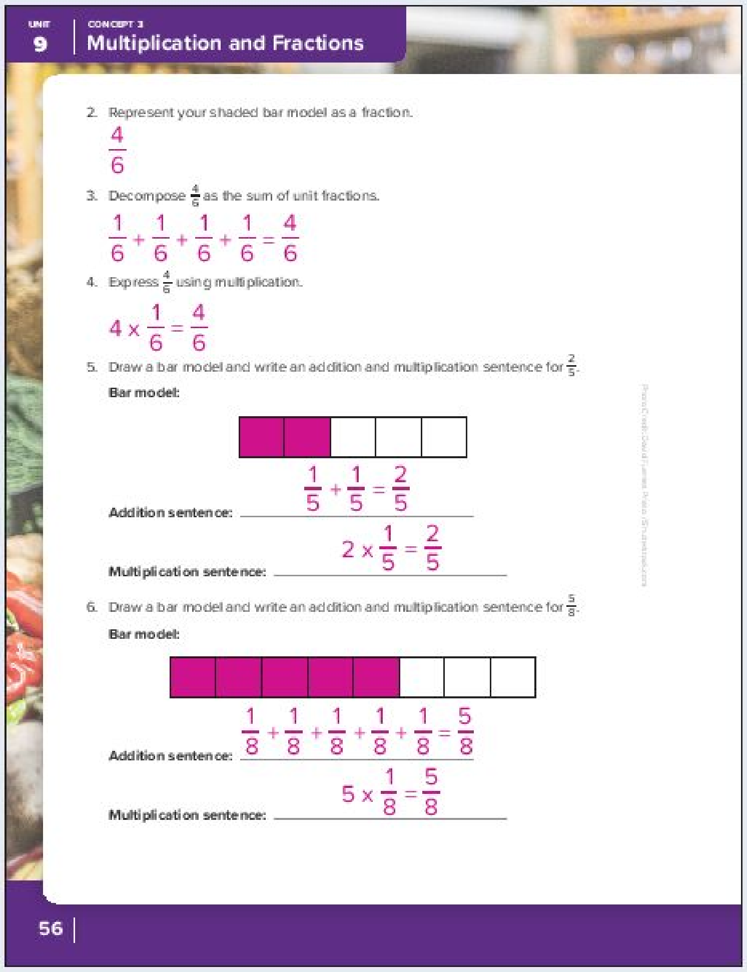
Student Page 56



UNIT 9 | CONCEPT 3 Multiplication and Fractions

2. Represent your shaded bar model as a fraction.

$\frac{4}{6}$

3. Decompose $\frac{4}{6}$ as the sum of unit fractions.

$\frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}=\frac{4}{6}$

4. Express $\frac{4}{6}$ using multiplication.

$4\times\frac{1}{6}=\frac{4}{6}$

5. Draw a bar model and write an addition and multiplication sentence for $\frac{2}{5}$.

Bar model:

Addition sentence: $\frac{1}{5}+\frac{1}{5}=\frac{2}{5}$

Multiplication sentence: $2\times\frac{1}{5}=\frac{2}{5}$

6. Draw a bar model and write an addition and multiplication sentence for $\frac{5}{8}$.

Bar model:

Addition sentence: $\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}=\frac{5}{8}$

Multiplication sentence: $5\times\frac{1}{8}=\frac{5}{8}$

56

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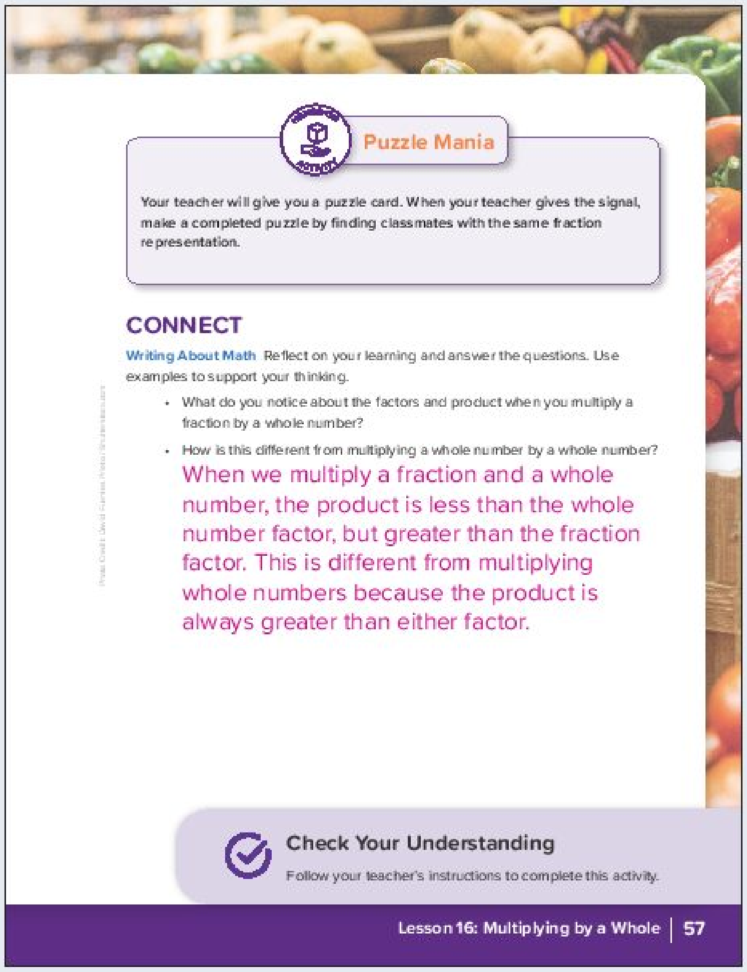
Student Page 57



Puzzle Mania

Your teacher will give you a puzzle card. When your teacher gives the signal, make a completed puzzle by finding classmates with the same fraction representation.

CONNECT

Writing About Math Reflect on your learning and answer the questions. Use examples to support your thinking.

- What do you notice about the factors and product when you multiply a fraction by a whole number?
- How is this different from multiplying a whole number by a whole number?

When we multiply a fraction and a whole number, the product is less than the whole number factor, but greater than the fraction factor. This is different from multiplying whole numbers because the product is always greater than either factor.

Check Your Understanding

Follow your teacher's instructions to complete this activity.

Lesson 16: Multiplying by a Whole | 57

3. Tell students that, at your signal, they will walk around the room and find their puzzle piece partners. When complete, each puzzle will have a fraction, a model, a repeated addition sentence, and a multiplication sentence.
4. The game is finished once all 8 puzzles are complete.
5. In the last 5 minutes of BUILD, ask students to share the strategies they used to complete the activity.

Answer Key for Puzzle Mania:

See the Puzzle Mania Answer Key at the end of this volume.

CONNECT (7 min)

Writing About Math

Ask students to turn to Lesson 16 CONNECT Writing About Math and respond to the questions.

Answer Key for Writing About Math:

When we multiply a fraction and a whole number, the product is less than the whole number factor, but greater than the fraction factor. This is different from multiplying whole numbers because the product is always greater than either factor.

WRAP-UP (3 min)

Let's Chat About Our Learning

Ask volunteers to share their thinking. Encourage students to ask each other questions and challenge each other's thinking.

PRACTICE

Direct students to Lesson 16 PRACTICE and have them complete the problems. Address student errors and misconceptions around multiplying fractions by whole numbers.

Check Your Understanding

1. Menna drinks $\frac{1}{9}$ of a carton of milk each day. How much milk does she drink in 5 days? Express your answer as a sum of unit fractions, and as an equivalent multiplication sentence. Draw a bar model if necessary.

   Sum of unit fractions: $\frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9} = \frac{5}{9}$

   Multiplication sentence: $5 \times \frac{1}{9} = \frac{5}{9}$

2. If it takes $\frac{2}{6}$ of a bag of flour for a cookie recipe, how much flour will it take to double the recipe?

   Sum of unit fractions: $\frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} = \frac{4}{6}$ of the bag (or $\frac{2}{6} + \frac{2}{6}$)

   Multiplication sentence: $\frac{1}{6} \times 4 = \frac{4}{6}$ of the bag (or $\frac{2}{6} \times 2 = \frac{4}{6}$; this may be a bit more challenging, but the addition equation and a bar model may clarify)

3. At a birthday party, there are 7 children. If each child eats $\frac{2}{18}$ of the pizza, how many slices will be eaten?

   Sum of unit fractions: $\frac{1}{18} + \frac{1}{18} + \frac{1}{18} + \frac{1}{18} + \frac{1}{18} + \frac{1}{18} + \frac{1}{18} + \frac{1}{18} + \frac{1}{18} + \frac{1}{18} + \frac{1}{18} + \frac{1}{18} + \frac{1}{18} + \frac{1}{18}$ = 14 slices (or $\frac{2}{18} + \frac{2}{18} + \frac{2}{18} + \frac{2}{18} + \frac{2}{18} + \frac{2}{18} + \frac{2}{18} = \frac{14}{18}$)

   Multiplication sentence: $\frac{1}{18} \times 14 = \frac{14}{18}$ slices will be eaten (or $\frac{2}{18} \times 7 = \frac{14}{18}$)

LESSON 17

Real-World Fraction Connection

Lesson Overview

In this lesson, students solve story problems involving fractions. The story problems refer to the same whole and challenge students to add or subtract fractions with like denominators. Some students may choose to simplify their answers, but it is not required.

Lesson Essential Questions

- What strategies can I use to find equivalent fractions?
- How do properties of multiplication of whole numbers apply to fractions?

Learning Objective

In this lesson

- Students will solve story problems involving fractions.

Grade-Level Standard

4.B.2.e Solve story problems involving addition and subtraction of fractions referring to the same whole and having like denominators

Vocabulary Check-In

Review concept vocabulary as needed.

Materials List

- Steps for Solving Problems Anchor Chart
- Unit 9 Lesson 17 Find Your Match Cards (1 card per student)
- Unit 9 Lesson 17 Find Your Match Cards Answer Key (at the end of this volume)

Preparation

Photocopy the Find Your Match Cards Blackline Master at the end of this volume.

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DIGITAL

Lesson 17

Real-World Fraction Connection

Quick Code:
egmt4118

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- When adding fractions, students may generalize the procedure for multiplication of fractions by adding the numerators and adding the denominators.

Adding and Subtracting Fractions

1. Ask students to turn to Lesson 17 ACCESS Adding and Subtracting Fractions to solve the addition and subtraction problems.
2. Ask students to discuss any patterns they noticed as they solved the problems. Encourage students to think about the meaning of these problems and what they would look like if they drew them. Clear up any misconceptions if needed.

BUILD (40 min)

Fraction Story Problems (20 min)

1. Display the Steps to Solving Story Problems Anchor Chart (if it is not already displayed). Direct students to Lesson 17 BUILD Fraction Story Problems. Read the Learning Targets together.
2. Ask students to discuss what they remember about the steps to solving story problems.
3. Work with students to solve Problem 1 in the Student Materials.
4. Ask students to finish Lesson 17 BUILD either independently, with a partner, or as a class depending on the needs of your students.
5. Use the last 5 minutes of BUILD to review the answers and have students share their problem-solving strategies.

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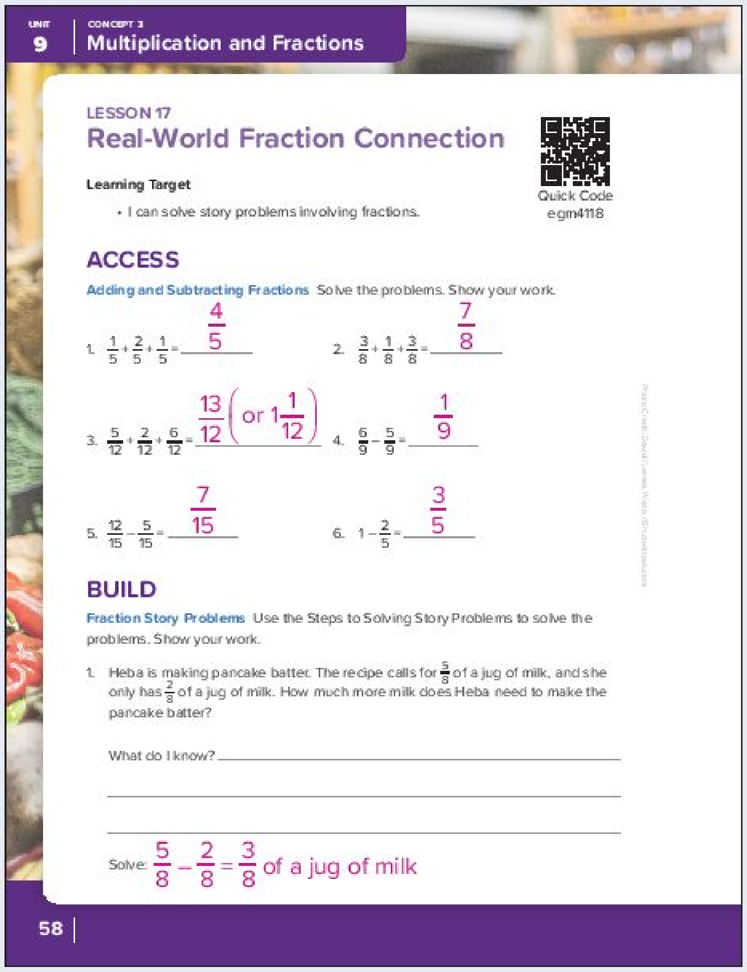
Student Page 58



UNIT 9 | CONCEPT 3 Multiplication and Fractions

LESSON 17

Real-World Fraction Connection

Quick Code
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Learning Target

- I can solve story problems involving fractions.

ACCESS

Adding and Subtracting Fractions Solve the problems. Show your work.

1. $\frac{1}{5}+\frac{2}{5}+\frac{1}{5}=$ $\frac{4}{5}$
2. $\frac{3}{8}+\frac{1}{8}+\frac{3}{8}=$ $\frac{7}{8}$
3. $\frac{5}{12}+\frac{2}{12}+\frac{6}{12}=$ $\frac{13}{12}\left(\text{or } 1\frac{1}{12}\right)$
4. $\frac{6}{9}-\frac{5}{9}=$ $\frac{1}{9}$
5. $\frac{12}{15}-\frac{5}{15}=$ $\frac{7}{15}$
6. $1-\frac{2}{5}=$ $\frac{3}{5}$

BUILD

Fraction Story Problems Use the Steps to Solving Story Problems to solve the problems. Show your work.

1. Heba is making pancake batter. The recipe calls for $\frac{5}{8}$ of a jug of milk, and she only has $\frac{2}{8}$ of a jug of milk. How much more milk does Heba need to make the pancake batter?

What do I know? ______

Solve: $\frac{5}{8}-\frac{2}{8}=\frac{3}{8}$ of a jug of milk

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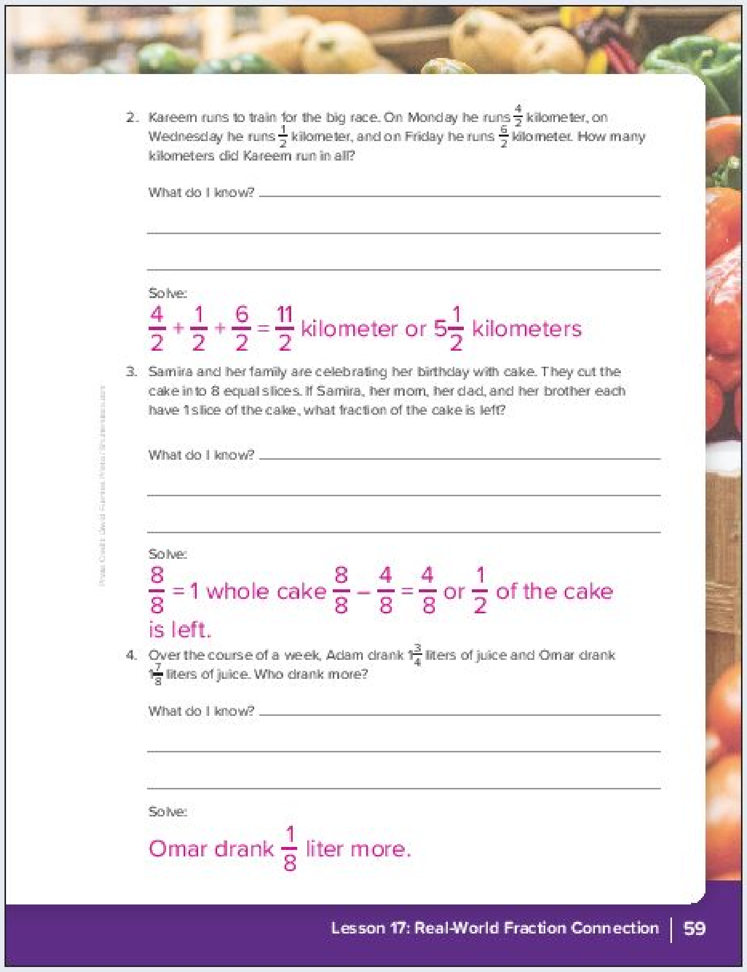
Student Page 59



2. Kareem runs to train for the big race. On Monday he runs $\frac{4}{2}$ kilometer, on Wednesday he runs $\frac{1}{2}$ kilometer, and on Friday he runs $\frac{6}{2}$ kilometer. How many kilometers did Kareem run in all?

What do I know? ______

Solve:

$\frac{4}{2} + \frac{1}{2} + \frac{6}{2} = \frac{11}{2}$ kilometer or $5\frac{1}{2}$ kilometers

3. Samira and her family are celebrating her birthday with cake. They cut the cake into 8 equal slices. If Samira, her mom, her dad, and her brother each have 1 slice of the cake, what fraction of the cake is left?

What do I know? ______

Solve:

$\frac{8}{8} = 1$ whole cake $\frac{8}{8} - \frac{4}{8} = \frac{4}{8}$ or $\frac{1}{2}$ of the cake is left.

4. Over the course of a week, Adam drank $1\frac{3}{4}$ liters of juice and Omar drank $1\frac{7}{8}$ liters of juice. Who drank more?

What do I know? ______

Solve:

Omar drank $\frac{1}{8}$ liter more.

Lesson 17: Real-World Fraction Connection | 59

Answer Key for Fraction Story Problems:

1. Heba is making pancake batter. The recipe calls for $\frac{5}{8}$ of the jug of milk, and she only has $\frac{2}{8}$ of a jug of milk. How much more milk does Heba need to make the pancake batter?

   What do I know? Heba has $\frac{2}{8}$ of milk but needs $\frac{5}{8}$ for the recipe.
   She does not have enough milk.
   The question is asking how much more milk does she need to make the pancake recipe.
   How much more means to subtract.
   The denominators are the same, so I subtract the numerators.
   Solve: $\frac{5}{8} - \frac{2}{8} = \frac{3}{8}$ of a jug of milk

2. Kareem runs to train for the big race. On Monday he runs $\frac{4}{2}$ km, on Wednesday he runs $\frac{1}{2}$ km and on Friday he runs $\frac{6}{2}$ km. How many kilometers did Kareem run in all?

   What do I know? On Monday Kareem runs $\frac{4}{2}$ kilometer; On Wednesday he runs $\frac{1}{2}$ kilometer; On Friday he runs $\frac{6}{2}$ kilometer; "In all" tells me to add.
   Solve: $\frac{4}{2} + \frac{1}{2} + \frac{6}{2} = \frac{11}{2}$ kilometers
   or $5\frac{1}{2}$ kilometers

3. Samira and her family are celebrating her birthday with cake. They cut the cake into 8 equal slices. If Samira, her mom, her dad and her brother each have 1 slice of the cake, what fraction of the cake is left?

   What do I know? There are 8 equal slices; 4 people eat 1 slice (Samira, mom, dad, brother);

   The question is asking how much cake is left as a fraction.

   Solve: $\frac{8}{8} = 1$ whole cake $\frac{8}{8} - \frac{4}{8} = \frac{4}{8}$ or $\frac{1}{2}$ of the cake is left.

4. Over the course of a week, Adam drank $1\frac{3}{4}$ liters of juice and Omar drank $1\frac{7}{8}$ liters of juice. Who drank more?

   What do I know? Adam drank $1\frac{3}{4}$; Omar drank $1\frac{7}{8}$;
   The question is asking who drank more.

   Solve: Adam drank $1\frac{3}{4} = 1\frac{6}{8}$
   $1\frac{7}{8} - 1\frac{6}{8} = \frac{1}{8}$
   Omar drank $\frac{1}{8}$ liter more.

Find Your Match (20 min)

1. Tell students that they will play Find Your Match. Distribute a card to each student. Explain that each card has a story problem to solve.
2. Ask students to turn to Lesson 17 BUILD Find Your Match and record the problem from their card.
3. Give students 2 or 3 minutes to solve their given story problem.
4. Use an Attention-Getting Signal to let students know that they will now get up and find their match. A match is a partner that has the same numerical answer. Although the question is not the same, the solution is.

   TEACHER NOTE: A student with a card labeled A must be paired with a student with a card labeled B.
5. Explain that students will share their story problem with their partner and explain how they solved it.
6. Students should then write down their partner's story problem and solve it in their Student Materials.
7. Use the last 5 minutes of BUILD to go over the answers with students. Ask volunteers to discuss how they used the problem-solving steps to solve the problems.
   Answers will vary.

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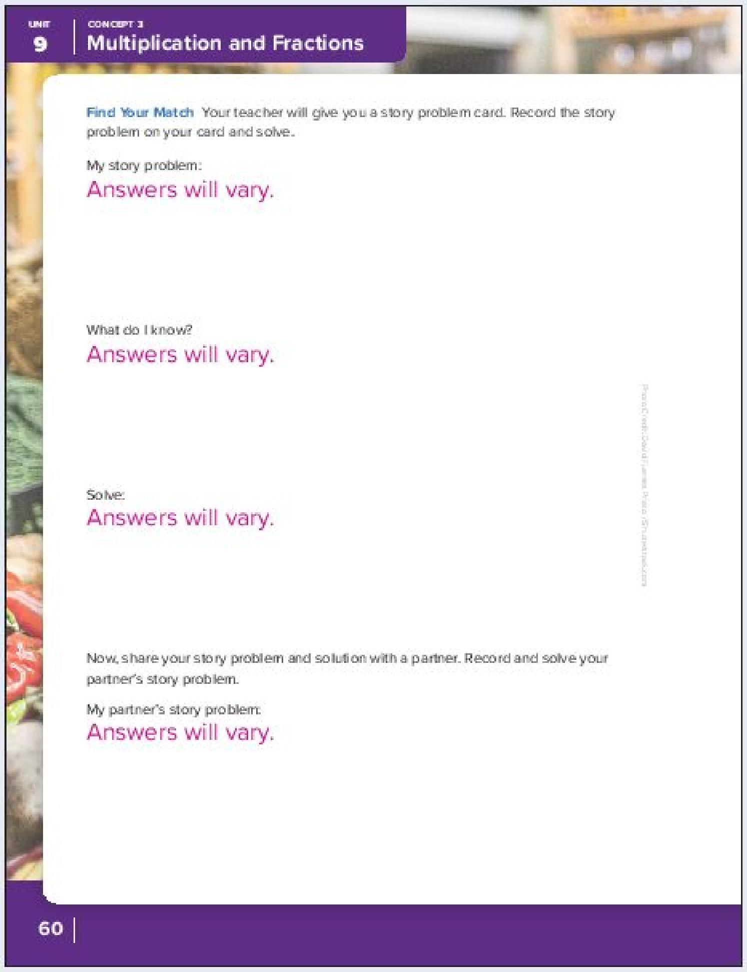
Student Page 60



UNIT 9 | CONCEPT 3 Multiplication and Fractions

Find Your Match Your teacher will give you a story problem card. Record the story problem on your card and solve.

My story problem:
Answers will vary.

What do I know?
Answers will vary.

Solve:
Answers will vary.

Now, share your story problem and solution with a partner. Record and solve your partner's story problem.

My partner's story problem:
Answers will vary.

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What do I know?

Answers will vary.

Solve:

Answers will vary.

CONNECT

Create Your Own Problem Write and solve your own fraction addition or subtraction story problem. Use one of the expressions provided or create your own.

Sample expressions: $2\frac{2}{7} + 1\frac{5}{7}$ $3\frac{7}{10} - 1\frac{8}{10}$

Answers will vary.

Check Your Understanding

Follow your teacher's instructions to complete this activity.

Lesson 17: Real-World Fraction Connection | 61

CONNECT (7 min)

Create Your Own Problem

Ask students to write their own addition or subtraction fraction story problem in Lesson 17 CONNECT Create your Own Problem. They can use one of the expressions provided or create their own.

WRAP-UP (3 min)

Problem Swap

Have students swap books with their Shoulder Partner. Ask students to solve their partner's story problem and check each other's answers.

Answers will vary. Shoulder Partners may check for accuracy.

PRACTICE

Direct students to Lesson 17 PRACTICE and have them complete the problems. Address student errors and misconceptions around solving story problems involving fractions.

Check Your Understanding

Solve three questions in a row, either horizontally, vertically, or diagonally.

Write a word problem involving subtraction of fractions so that the solution equals $\frac{4}{5}$. Answers will vary.	Jana was $\frac{11}{12}$ meters tall on her birthday. After three months, she had grown another $\frac{3}{12}$ meters tall. How tall is Jana now? $1\frac{2}{12}$ meters tall	Ammar and Ehab were playing outside. Ammar stayed outside for 4 hours and Ehab stayed outside for $2\frac{5}{6}$ hours. How many more hours was Ammar outside than Ehab? $1\frac{1}{6}$ hours more
Dalia, Eman, and Aya baked trays of cookies. Dalia baked $1\frac{6}{7}$ trays of cookies, Eman baked $2\frac{4}{7}$ trays of cookies, and Aya baked $3\frac{2}{7}$ trays of cookies. How many trays of cookies did they bake altogether? $7\frac{5}{7}$ trays of cookies	Haidy had two cakes. She cut one cake into 6 equal slices and ate 2 pieces. She cut the second cake into 12 equal slices. If she ate the same amount, how many pieces did she eat? 4 pieces	Ezz ran $1\frac{2}{9}$ kilometers and Ehab ran $\frac{8}{9}$ kilometers. How much farther did Ezz run than Ehab? $\frac{3}{9}$ (or $\frac{1}{3}$) km farther
Azza combined two buckets of water. One held $2\frac{3}{5}$ liters of water and the other held $4\frac{4}{5}$ liters of water. How much water does Azza have in all? $7\frac{2}{5}$ liters of water	Ayman painted $\frac{5}{16}$ of his wall blue. How much more does he still need to paint? $\frac{11}{16}$ more to paint	Write a word problem involving addition of fractions so that the solution equals $\frac{8}{12}$. Answers will vary.

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Concept Check-In and Remediation

Lesson Overview

In this lesson, students work to correct misconceptions and errors from Concept Three: Multiplication and Fractions. First, administer the Concept Check-In. Once you have reviewed the quiz results, choose remediation activities based on the needs of your students. Some recommendations are listed in the chart, but the needs of your particular students should inform your choices. Students may work independently, in pairs, or in a small group with the teacher.

Lesson Essential Questions

- What strategies can I use to find equivalent fractions?
- How do properties of multiplication of whole numbers apply to fractions?

Learning Objective

In this lesson

- Students will work to correct misconceptions and errors related to generating equivalent fractions and solving fraction story problems.

Grade-Level Standards

4.B.1 Extend understanding of fraction equivalence and ordering.

4.B.1.a Explain cases of fraction equivalency by using visual fraction models.

4.B.1.b Explain how the number and size of the parts of equivalent fractions differ even though the two fractions themselves are the same size.

4.B.1.c Identify and generate equivalent fractions.

4.B.2.e Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators.

4.B.2.f Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.

   i. Demonstrate understanding that fraction $\frac{a}{b}$ is a multiple of $\frac{1}{b}$.

Materials List

- Materials may vary

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DIGITAL

Concept Check-In and Remediation

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ii. Demonstrate understanding that a multiple of $\frac{a}{b}$ is a multiple of $\frac{1}{b}$, and use this understanding to multiply a fraction by a whole number.

iii. Solve word problems involve multiplication of a fraction by a whole number using numerals, words, and models.

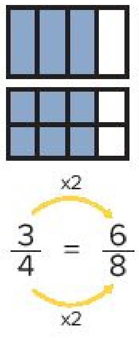
Vocabulary Check-In

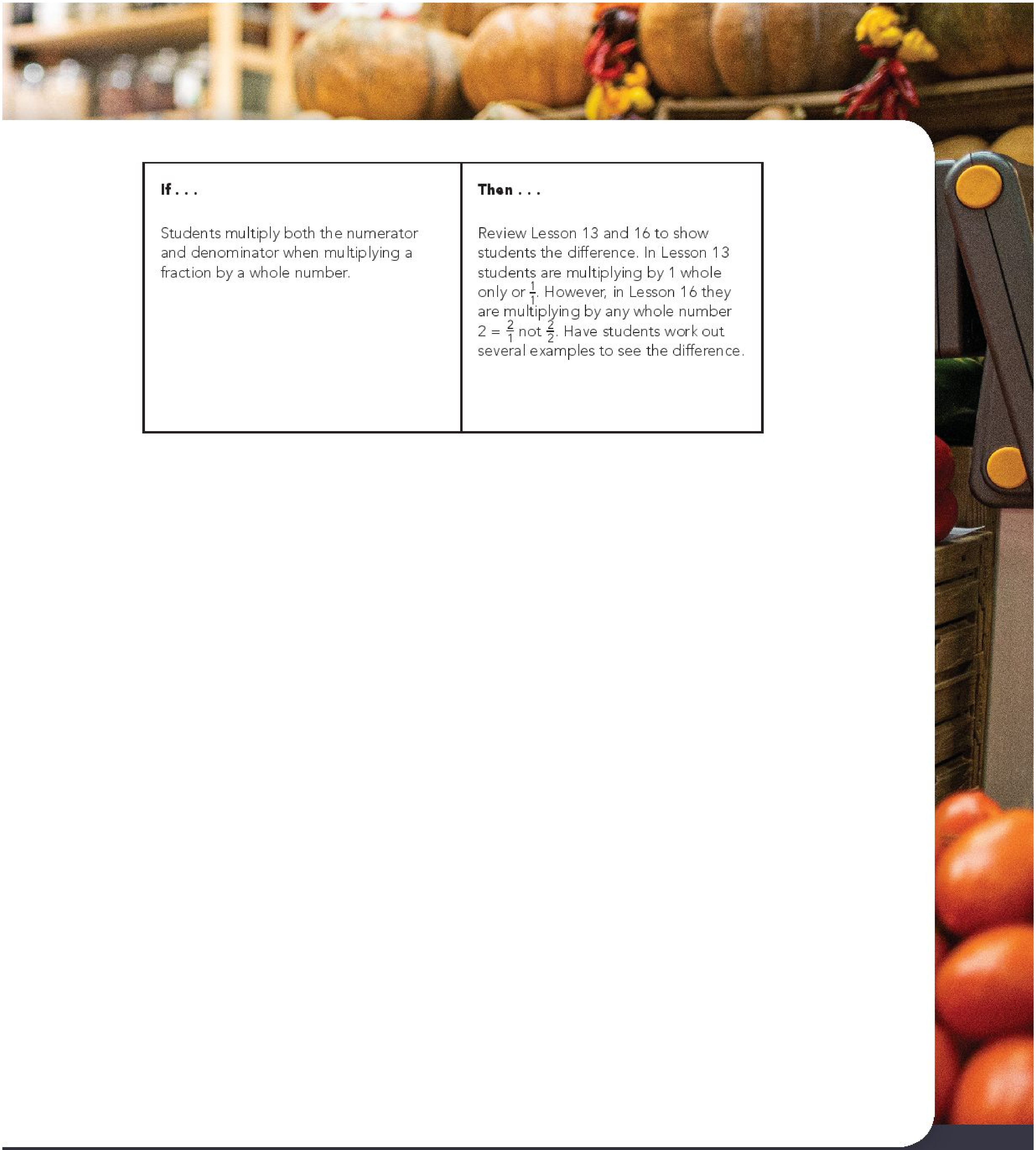
Review concept vocabulary as needed.

COMMON MISCONCEPTIONS AND ERRORS

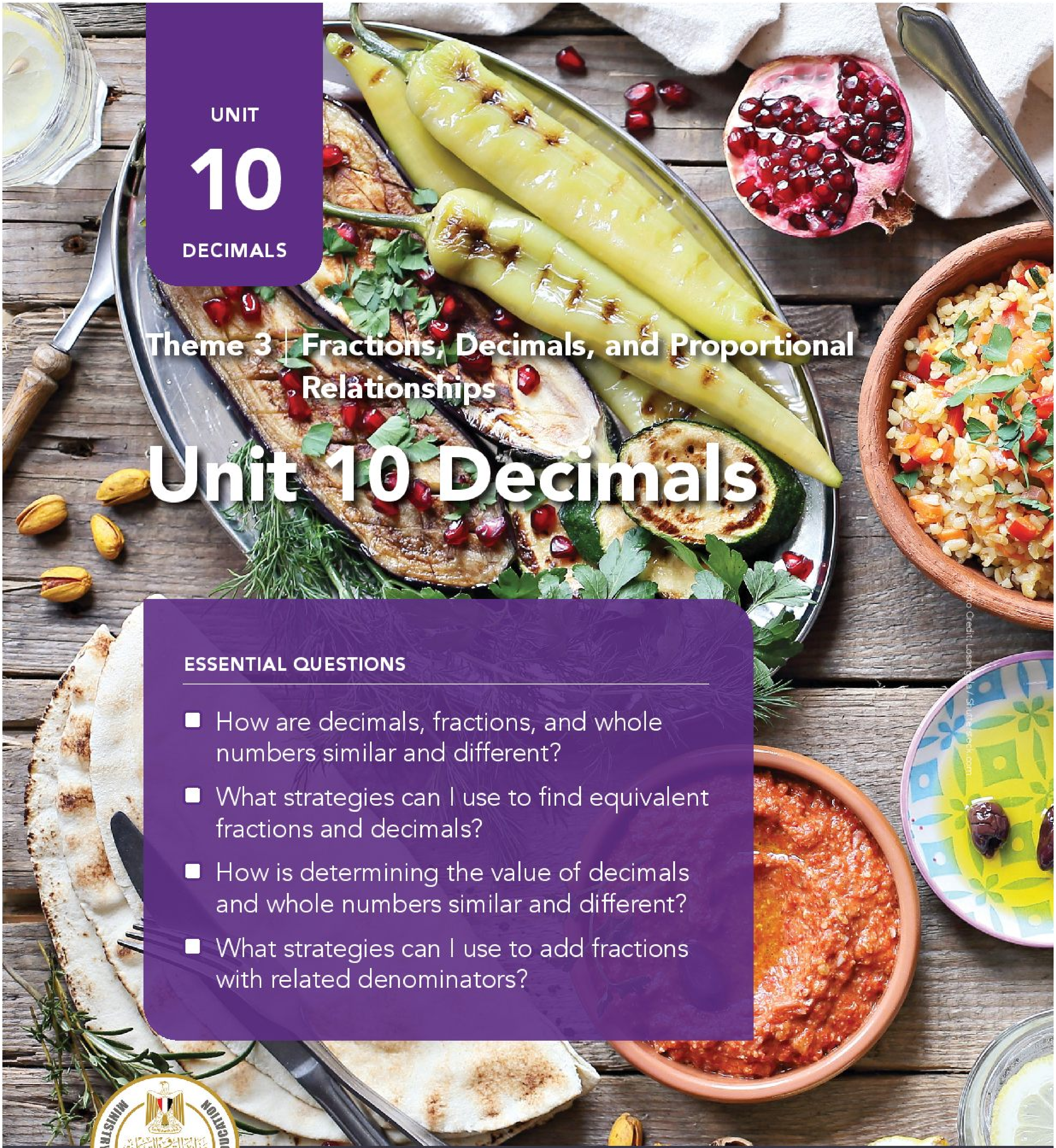
- Students often believe that performing an operation always changes the value of the original quantity, even when multiplying or dividing by 1 with whole numbers and fractions.
- Students may not understand that any fraction in $\frac{b}{b}$ form is equal to 1.
- Students may not increase the numerator and the denominator by the same factor or only increase or decrease the denominator, not understanding that equivalence is about representing the same quantity.
- When multiplying fractions by a whole number, students may multiply the numerator and denominator (similar to multiplying to make equivalent fractions) rather than recognizing that a whole number, x, is represented in a fractional way as $\frac{x}{1}$.

Remediation: Correcting Misconceptions

If . . . Students do not understand that any fraction in $\frac{b}{b}$ form is equal to 1.	**Then . . .** Review Lesson 13 BUILD From Parts to a Whole and ask students to use the fraction table to create as many forms of 1 as they can with fractions. Example: $\frac{3}{3}$, $\frac{5}{5}$, $\frac{12}{12}$
If . . . Students believe that performing an operation always changes the value of the original quantity, even when multiplying or dividing by 1 with whole.	**Then . . .** Review Lesson 13 BUILD Creating Equivalent Fractions to help students generate equivalent fractions and place them on a number line with benchmark fractions.
If . . . Students do not increase the numerator and the denominator by the same factor or only increase/decrease the denominator such as $\frac{1}{2}=\frac{1}{4}$ not understanding that equivalence is about representing the same quantity.	**Then . . .** Review Lesson 15 BUILD. Have students use visual models to create equivalent fractions and then write out the fractions and what each numerator and denominator was increased or decreased by. Repeat with lots of examples using models and linking to the bare numbers. See example 



If . . .	**Then . . .**
Students multiply both the numerator and denominator when multiplying a fraction by a whole number.	Review Lesson 13 and 16 to show students the difference. In Lesson 13 students are multiplying by 1 whole only or $\frac{1}{1}$. However, in Lesson 16 they are multiplying by any whole number $2 = \frac{2}{1}$ not $\frac{2}{2}$. Have students work out several examples to see the difference.



UNIT

10

DECIMALS

Theme 3 | Fractions, Decimals, and Proportional Relationships

Unit 10 Decimals

ESSENTIAL QUESTIONS

- How are decimals, fractions, and whole numbers similar and different?
- What strategies can I use to find equivalent fractions and decimals?
- How is determining the value of decimals and whole numbers similar and different?
- What strategies can I use to add fractions with related denominators?

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Video Questions

The Unit 10 Opener Video, Decimal Ice Cubes, uses an everyday object – an ice cube tray – to help students build understanding of decimals and consider their relationship to fractions. Students are challenged to explore decimal and fraction representations in the world around them.

- Where do you see parts of a whole in the real world?
- How do you describe parts of a whole?
- How does it change when the whole changes?

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Key Vocabulary

As students investigate real-world situations, they will develop an understanding of and be introduced to the following key vocabulary:

common denominator, decimal fraction, decimal notation, decimal number, decimal point, denominator, equivalence, equivalent, expanded form, fractions, hundredths, kilogram, place value, standard form, tenths, unit form, word form

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egmt4139

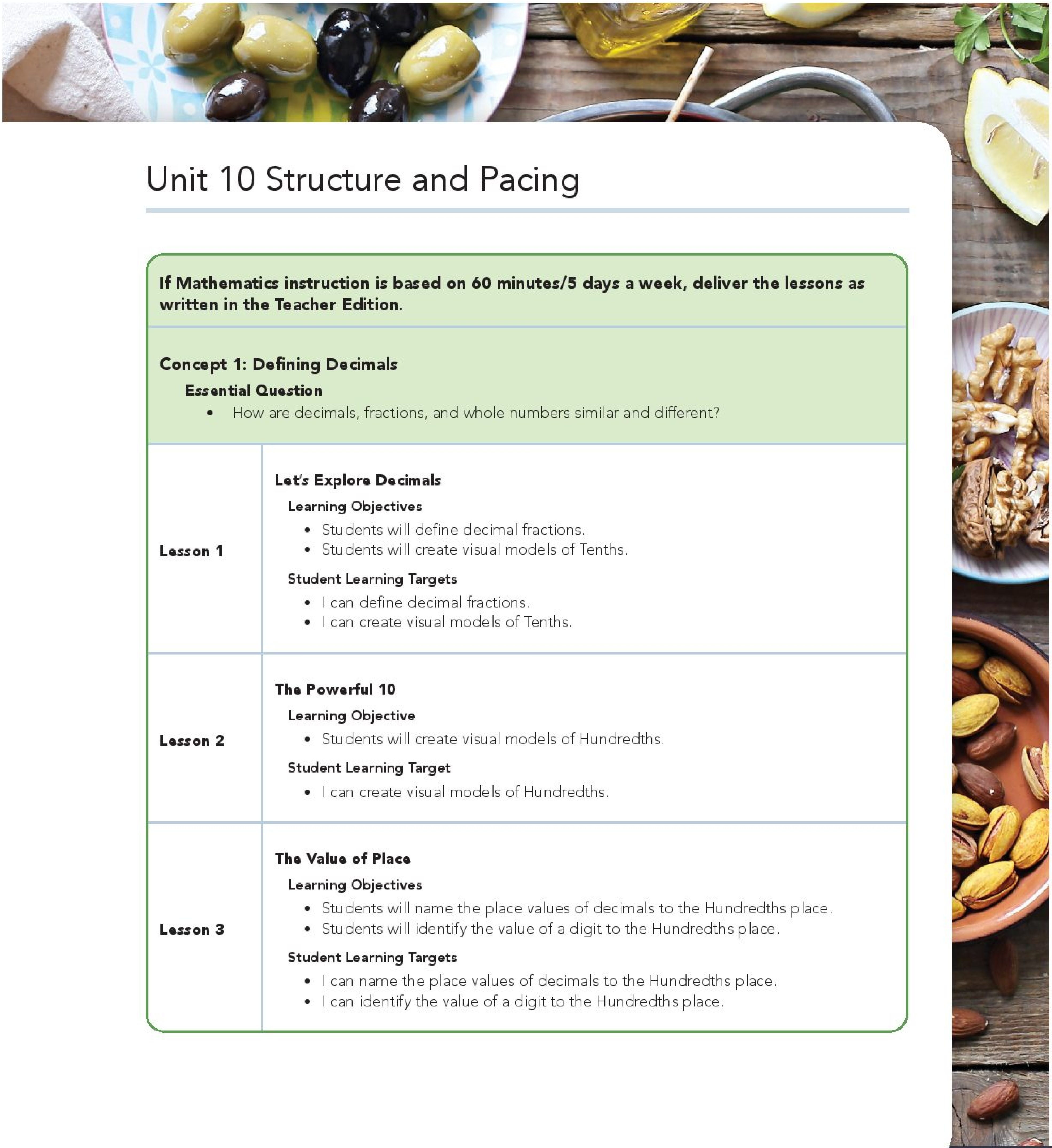
Unit Storyline

Unit 10 Decimals Storyline

In the Decimals unit, students learn about decimal numbers. Students build understanding of decimal quantities by exploring the relationship between decimals and fractions. They extend their knowledge of place value as they model, read, and write decimal numbers to the Tenths and Hundredths places. To support their learning, students observe video footage and investigate problems that involve real-world application of decimal numbers.

Unit Standards

4.A.3.a	Read and write decimals to Hundredths using numerals, word form, and expanded form.
4.A.3.b	Use models to illustrate and compare decimals to Hundredths.
4.B.3.a	Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100 (for example express $\frac{2}{10}$ as $\frac{20}{100}$ and add $\frac{2}{10} + \frac{5}{100} = \frac{25}{100}$).
4.B.3.b	Use decimal notation for fractions with denominators 10 or 100 (for example, write $\frac{62}{100}$ as .62).
4.B.3.c	Compare two decimals to the Hundredths place.
4.B.3.d	Demonstrate understanding that decimal comparisons are valid only when the two decimals refer to the same whole.
4.B.3.e	Record the results of decimal comparisons using the symbols >, <, =.



Unit 10 Structure and Pacing

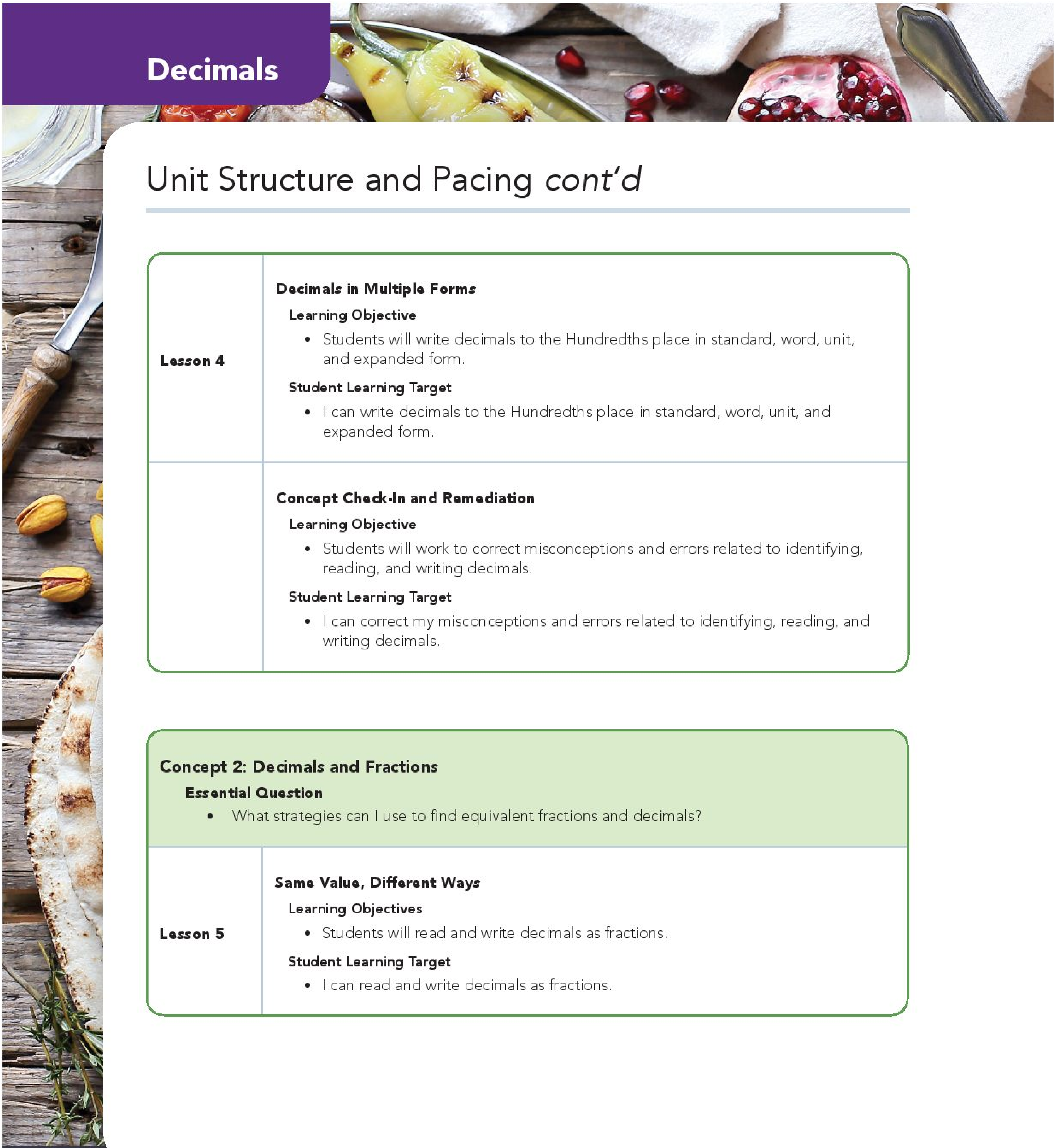
If Mathematics instruction is based on 60 minutes/5 days a week, deliver the lessons as written in the Teacher Edition.

Concept 1: Defining Decimals

Essential Question

- How are decimals, fractions, and whole numbers similar and different?

Lesson 1	**Let's Explore Decimals** **Learning Objectives** • Students will define decimal fractions. • Students will create visual models of Tenths. **Student Learning Targets** • I can define decimal fractions. • I can create visual models of Tenths.
Lesson 2	**The Powerful 10** **Learning Objective** • Students will create visual models of Hundredths. **Student Learning Target** • I can create visual models of Hundredths.
Lesson 3	**The Value of Place** **Learning Objectives** • Students will name the place values of decimals to the Hundredths place. • Students will identify the value of a digit to the Hundredths place. **Student Learning Targets** • I can name the place values of decimals to the Hundredths place. • I can identify the value of a digit to the Hundredths place.



Unit Structure and Pacing *cont'd*

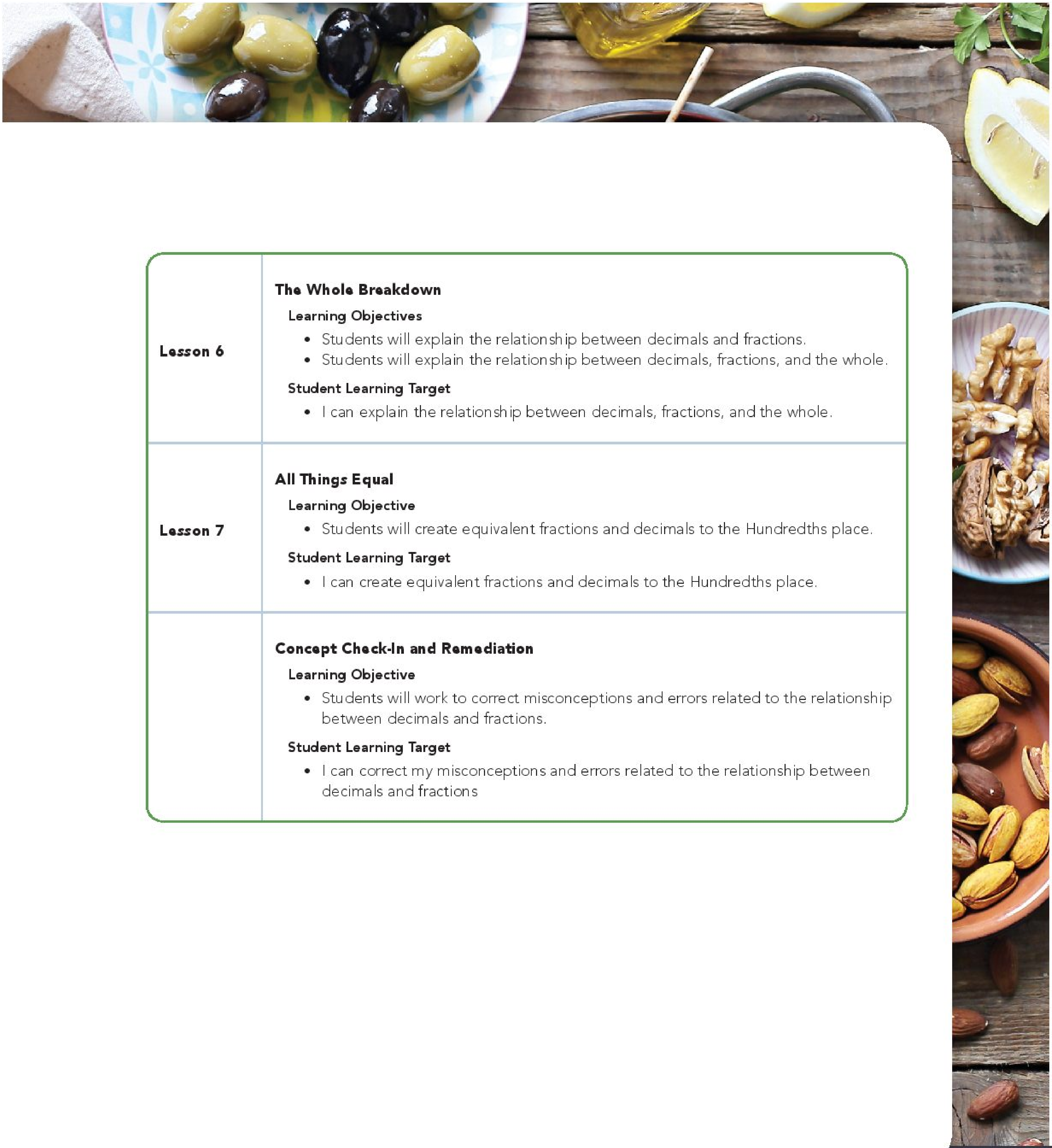
Lesson 4	**Decimals in Multiple Forms** **Learning Objective** • Students will write decimals to the Hundredths place in standard, word, unit, and expanded form. **Student Learning Target** • I can write decimals to the Hundredths place in standard, word, unit, and expanded form.
	Concept Check-In and Remediation **Learning Objective** • Students will work to correct misconceptions and errors related to identifying, reading, and writing decimals. **Student Learning Target** • I can correct my misconceptions and errors related to identifying, reading, and writing decimals.

Concept 2: Decimals and Fractions

Essential Question

- What strategies can I use to find equivalent fractions and decimals?

Lesson 5	**Same Value, Different Ways** **Learning Objectives** • Students will read and write decimals as fractions. **Student Learning Target** • I can read and write decimals as fractions.



Lesson 6	**The Whole Breakdown** **Learning Objectives** • Students will explain the relationship between decimals and fractions. • Students will explain the relationship between decimals, fractions, and the whole. **Student Learning Target** • I can explain the relationship between decimals, fractions, and the whole.
Lesson 7	**All Things Equal** **Learning Objective** • Students will create equivalent fractions and decimals to the Hundredths place. **Student Learning Target** • I can create equivalent fractions and decimals to the Hundredths place.
	Concept Check-In and Remediation **Learning Objective** • Students will work to correct misconceptions and errors related to the relationship between decimals and fractions. **Student Learning Target** • I can correct my misconceptions and errors related to the relationship between decimals and fractions

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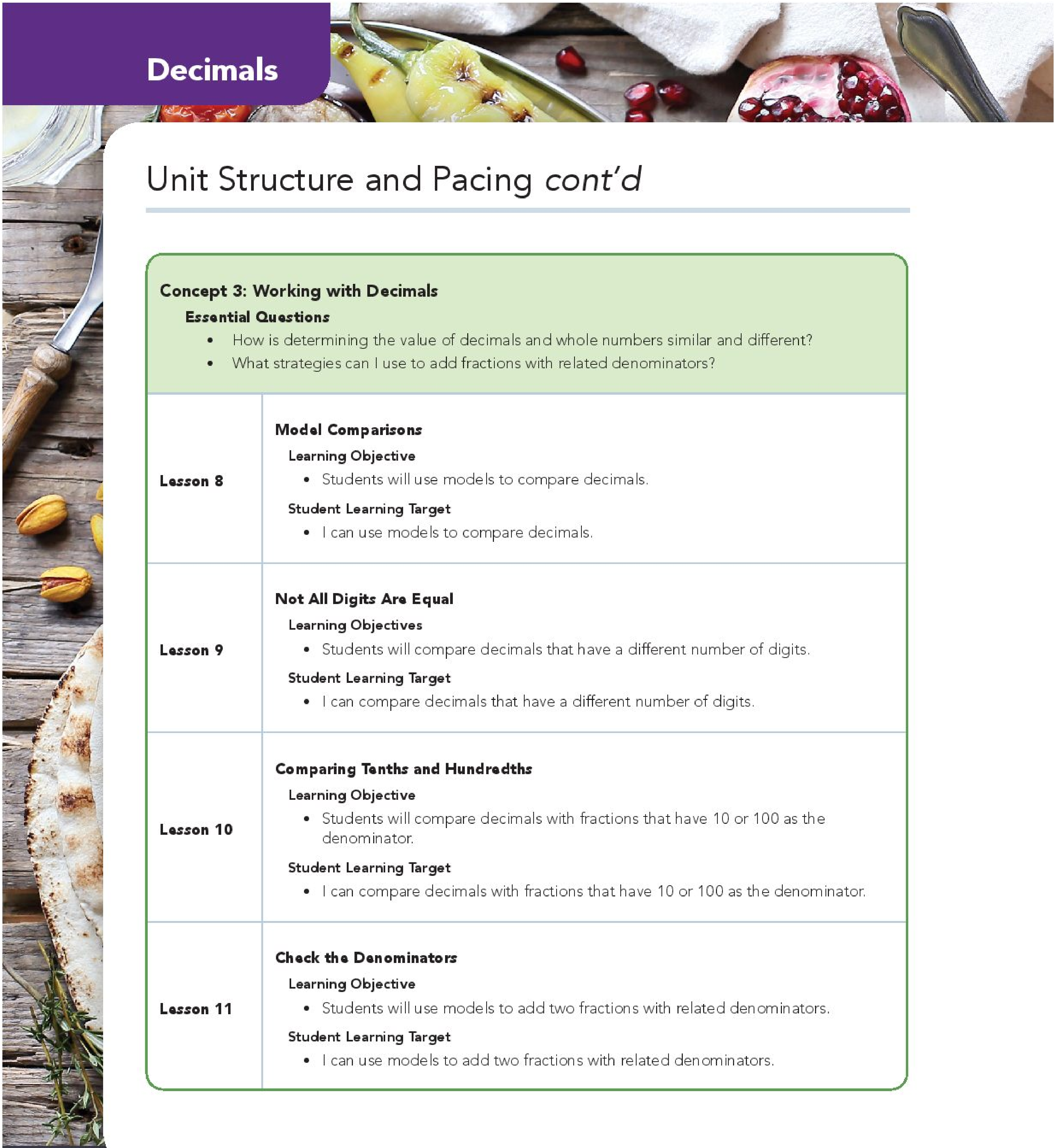


Unit Structure and Pacing *cont'd*

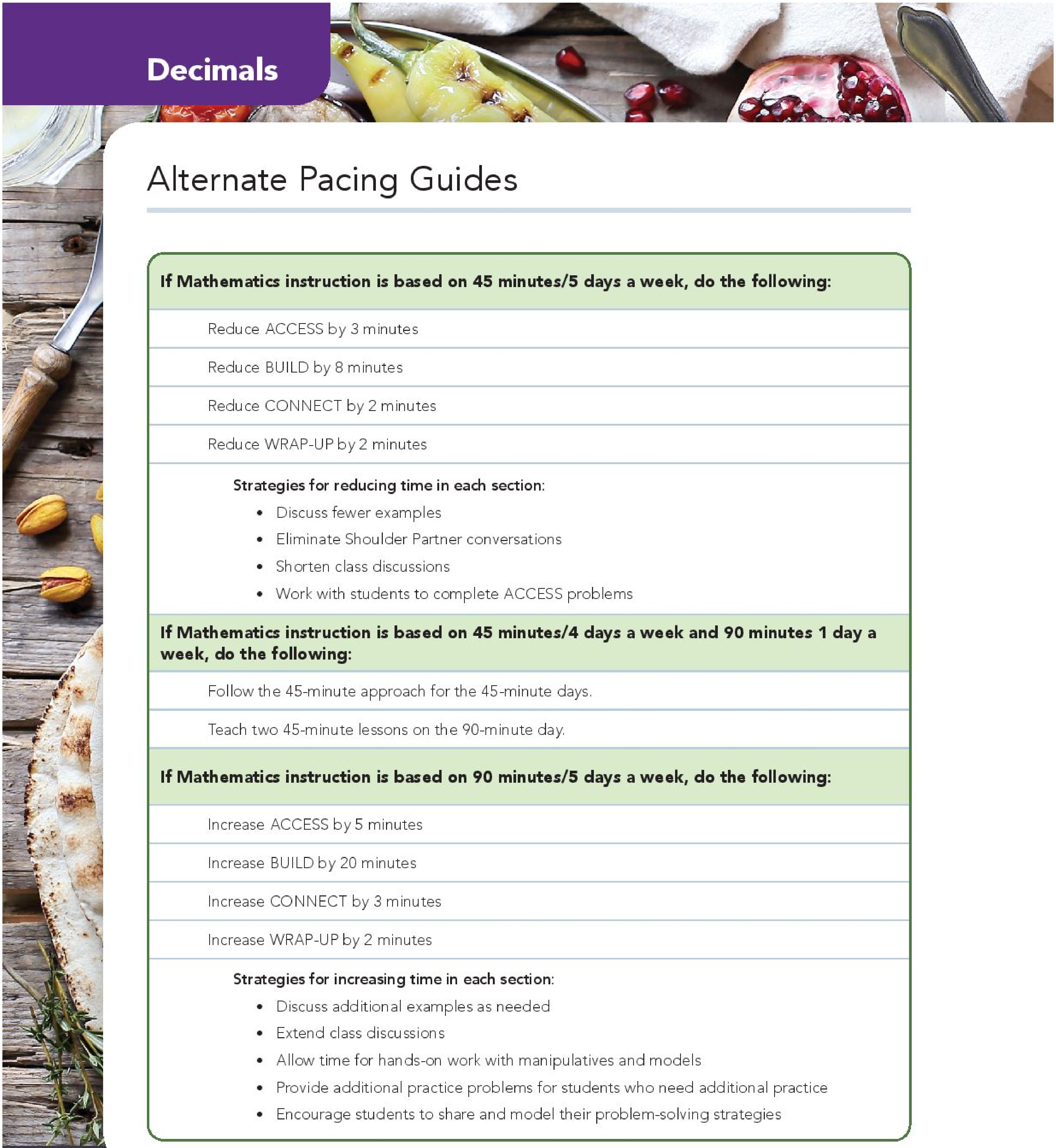
Concept 3: Working with Decimals

Essential Questions

- How is determining the value of decimals and whole numbers similar and different?
- What strategies can I use to add fractions with related denominators?

Lesson 8	**Model Comparisons** **Learning Objective** • Students will use models to compare decimals. **Student Learning Target** • I can use models to compare decimals.
Lesson 9	**Not All Digits Are Equal** **Learning Objectives** • Students will compare decimals that have a different number of digits. **Student Learning Target** • I can compare decimals that have a different number of digits.
Lesson 10	**Comparing Tenths and Hundredths** **Learning Objective** • Students will compare decimals with fractions that have 10 or 100 as the denominator. **Student Learning Target** • I can compare decimals with fractions that have 10 or 100 as the denominator.
Lesson 11	**Check the Denominators** **Learning Objective** • Students will use models to add two fractions with related denominators. **Student Learning Target** • I can use models to add two fractions with related denominators.

Lesson 12	**Putting the Pieces Together** **Learning Objective** • Students will add two fractions with related denominators. **Student Learning Target** • I can add two fractions with related denominators.
	Concept Check-In and Remediation **Learning Objective** • Students will work to correct misconceptions and errors related to comparing decimals and fractions. **Student Learning Target** • I can correct my misconceptions and errors related to comparing decimals and fractions.



Alternate Pacing Guides

If Mathematics instruction is based on 45 minutes/5 days a week, do the following:

Reduce ACCESS by 3 minutes

Reduce BUILD by 8 minutes

Reduce CONNECT by 2 minutes

Reduce WRAP-UP by 2 minutes

Strategies for reducing time in each section:

- Discuss fewer examples
- Eliminate Shoulder Partner conversations
- Shorten class discussions
- Work with students to complete ACCESS problems

If Mathematics instruction is based on 45 minutes/4 days a week and 90 minutes 1 day a week, do the following:

Follow the 45-minute approach for the 45-minute days.

Teach two 45-minute lessons on the 90-minute day.

If Mathematics instruction is based on 90 minutes/5 days a week, do the following:

Increase ACCESS by 5 minutes

Increase BUILD by 20 minutes

Increase CONNECT by 3 minutes

Increase WRAP-UP by 2 minutes

Strategies for increasing time in each section:

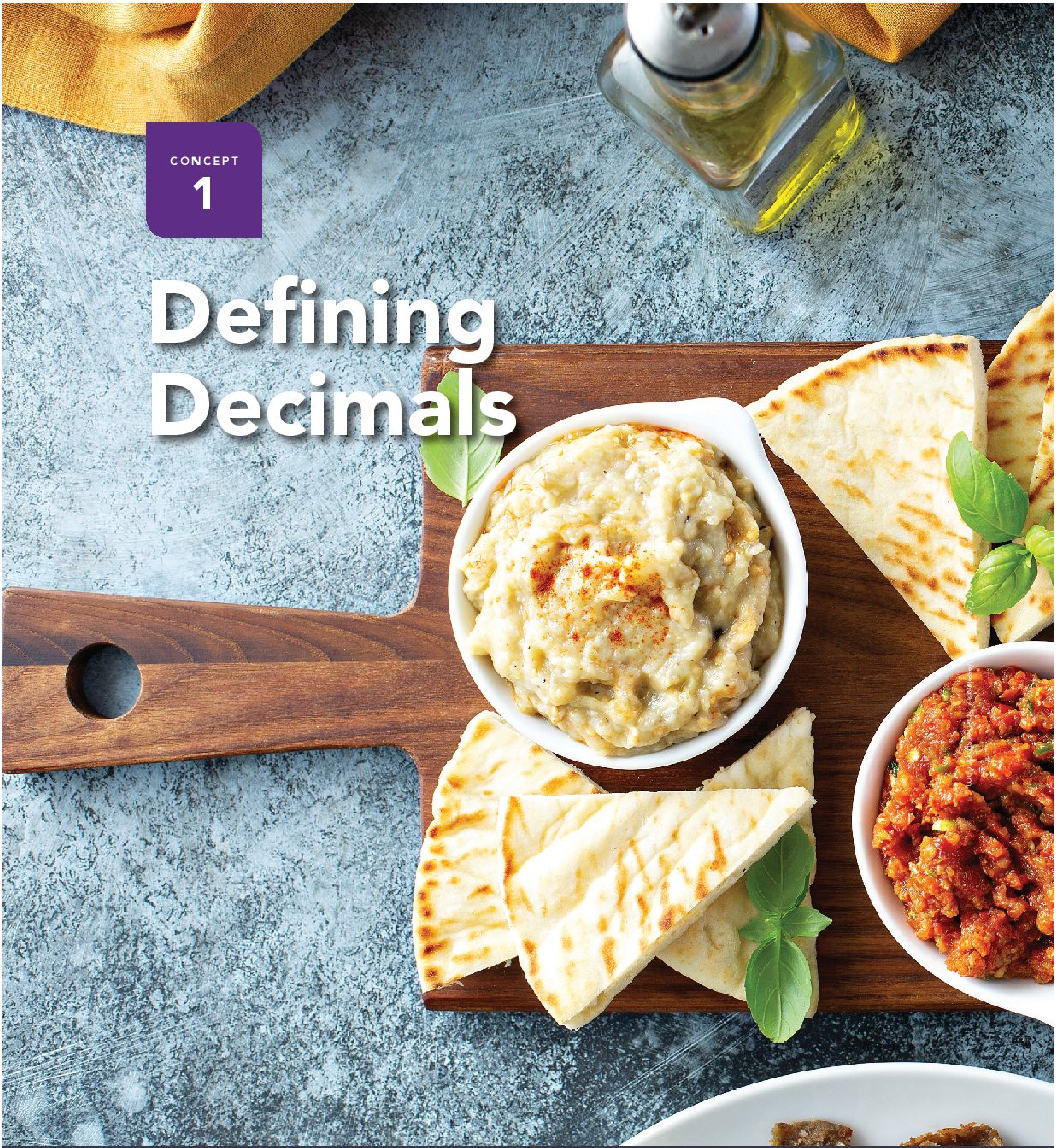
- Discuss additional examples as needed
- Extend class discussions
- Allow time for hands-on work with manipulatives and models
- Provide additional practice problems for students who need additional practice
- Encourage students to share and model their problem-solving strategies

Mathematical Background Knowledge

In Primary 3, students explored fractions and created simple equivalent fractions. In Primary 4, students extend this by comparing fractions, finding equivalence, and solving addition and subtraction problems with fractions and decimals. In Unit 10, students apply this understanding to decimals. They define a decimal fraction and make a connection between fractions and decimals. They read and write decimals using place value understanding and visual models. They learn to compare decimals with a different number of digits, and explore how to compare decimals and fractions with 10 or 100 as the denominator. Next, students decompose whole numbers into Tenths and Hundredths, find equivalent decimals and fractions for Tenths and Hundredths, and solve problems that involve decimals to the Hundredths place.

In Primary 3, students read and wrote whole numbers to 100,000 in word, standard, and expanded form. In Primary 4, students build on this knowledge of place value by reading and writing decimals to the Hundredths place using standard, word, and expanded form. It is important that students build place value understanding of decimals. These concepts help students look at numbers in a new way and solve challenging problems involving decimals.

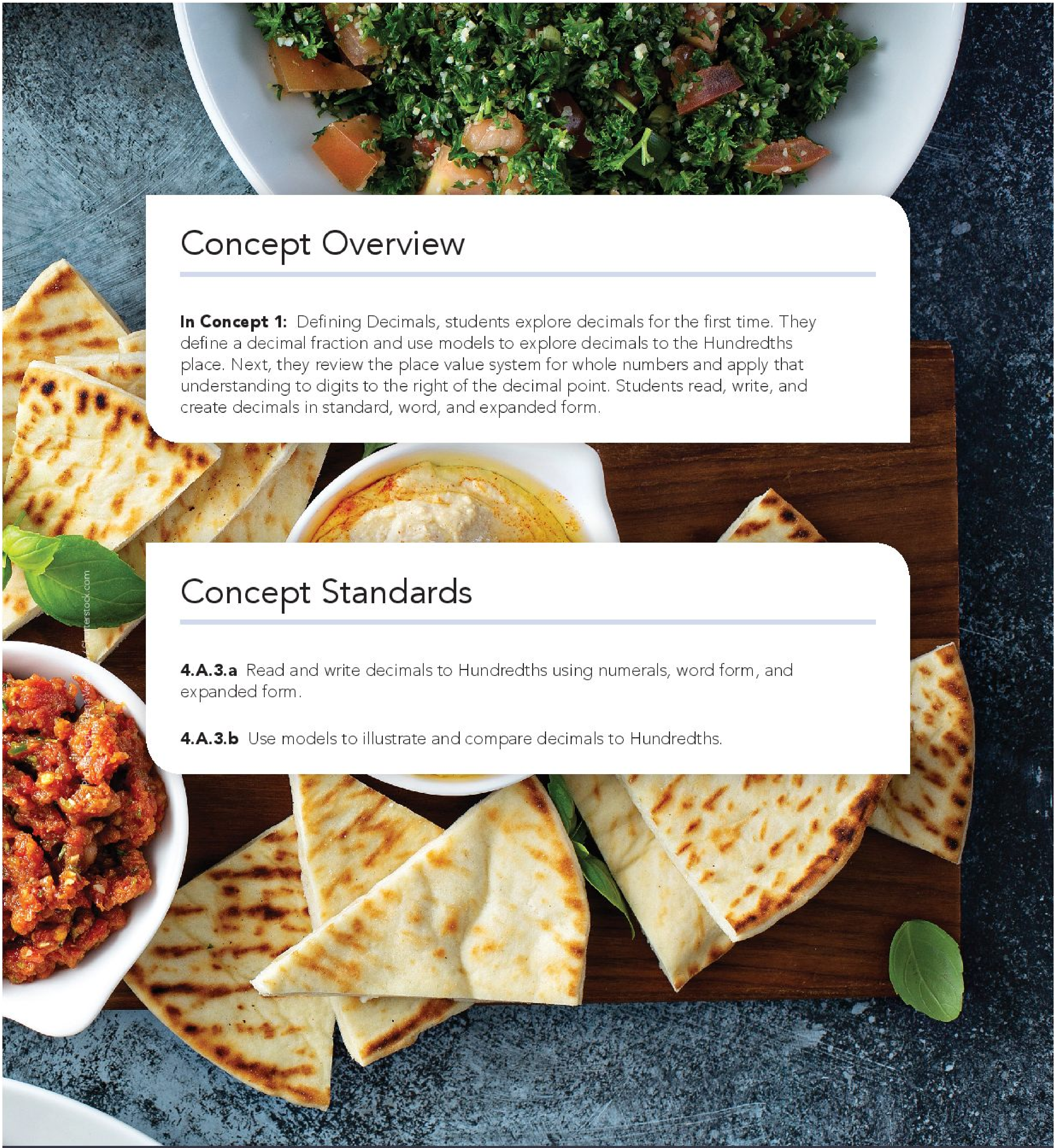
In Primary 3, students used concrete models to add and subtract fractions with like denominators. They identified and created simple equivalent fractions using concrete models. In Primary 4, students apply their knowledge of equivalence to create more complex equivalent fractions. They apply that understanding to add two fractions with related denominators (Tenths and Hundredths) using concrete models. Then, they find a common denominator for related fractions. Finally, they solve bare number problems and story problems involving addition.



CONCEPT

1

Defining Decimals



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Concept Overview

In Concept 1: Defining Decimals, students explore decimals for the first time. They define a decimal fraction and use models to explore decimals to the Hundredths place. Next, they review the place value system for whole numbers and apply that understanding to digits to the right of the decimal point. Students read, write, and create decimals in standard, word, and expanded form.

Concept Standards

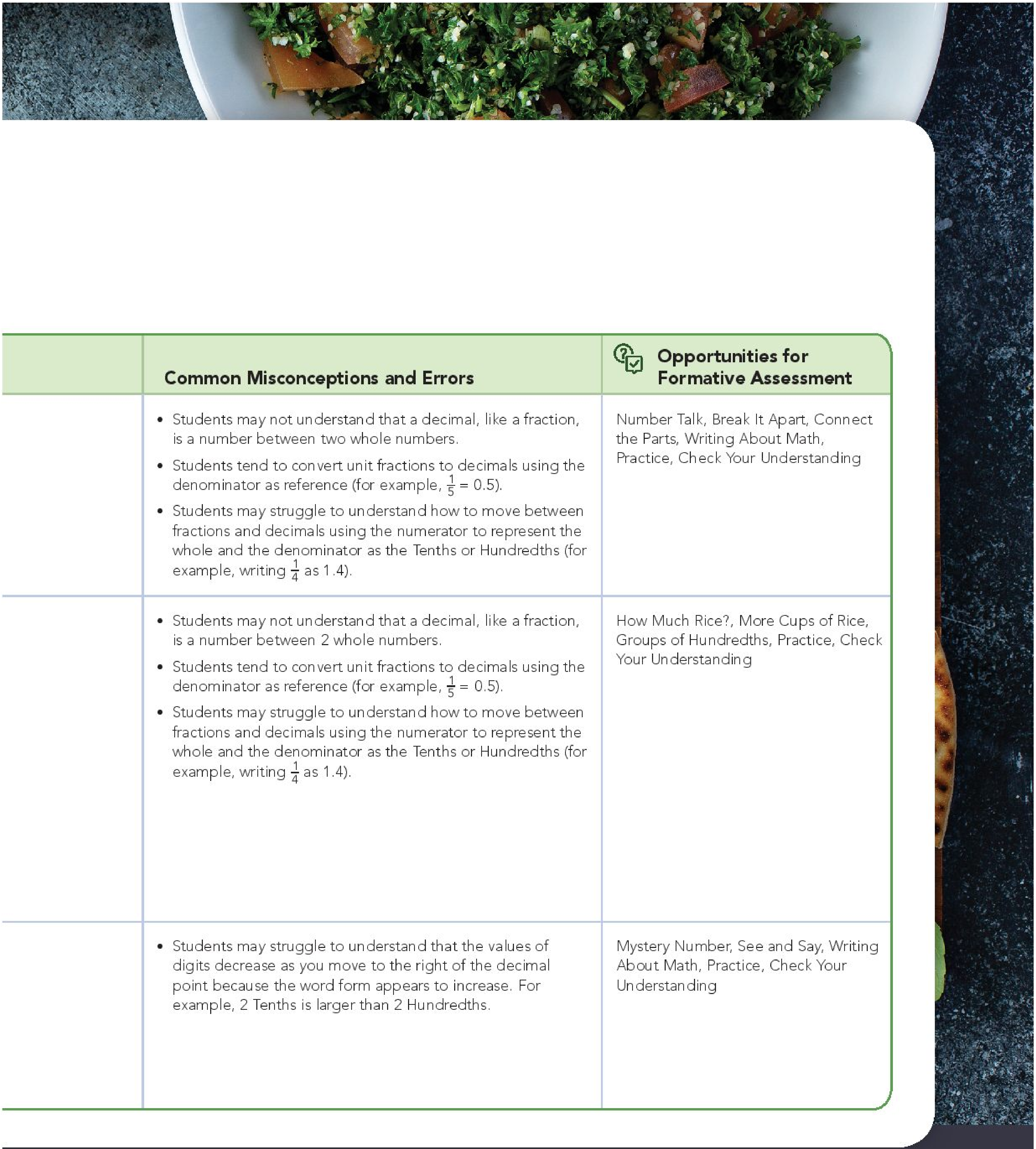
4.A.3.a Read and write decimals to Hundredths using numerals, word form, and expanded form.

4.A.3.b Use models to illustrate and compare decimals to Hundredths.

Concept Planner

All lessons are designed to be 60 minutes. The materials listed in this chart are items to gather for each group. Items for the class or for individual students are indicated as needed.

Lesson Name	Materials for Lesson	Vocabulary Terms	Learning Objectives	
1 Let's Explore Decimals	• Meterstick • Strip of paper, 1 meter long • Colored markers or pencils • Metric Conversion chart (from Unit 3)	Decimal number Decimal fraction Decimal point Fraction Tenths	• Students will define decimal fractions. • Students will create visual models of Tenths.	
2 The Powerful 10	• Unit 10 Lesson 2 Hundredths Grid Model (See the Blackline Master at the end of this volume. Photocopy multiple copies for use or create a transparency for an overhead projector.) • Unit 10 Lesson 2 Tenths and Hundredths Models (optional) • Bag of rice, 1 kilogram • Clear cups, 10 (Pour 100 grams of rice into each cup and mark a line on the cups. Pour the rice back into the bag.) • Colored pencils or markers	Hundredths Kilogram	• Students will create visual models of Hundredths.	
3 The Value of Place	• Digit Cards 0–9 (From Unit 1)	Hundredths Place value Tenths	• Students will name the place values of decimals to the Hundredths place. • Students will identify the value of a digit to the Hundredths place.	



	Common Misconceptions and Errors	Opportunities for Formative Assessment
	• Students may not understand that a decimal, like a fraction, is a number between two whole numbers. • Students tend to convert unit fractions to decimals using the denominator as reference (for example, $\frac{1}{5}$ = 0.5). • Students may struggle to understand how to move between fractions and decimals using the numerator to represent the whole and the denominator as the Tenths or Hundredths (for example, writing $\frac{1}{4}$ as 1.4).	Number Talk, Break It Apart, Connect the Parts, Writing About Math, Practice, Check Your Understanding
	• Students may not understand that a decimal, like a fraction, is a number between 2 whole numbers. • Students tend to convert unit fractions to decimals using the denominator as reference (for example, $\frac{1}{5}$ = 0.5). • Students may struggle to understand how to move between fractions and decimals using the numerator to represent the whole and the denominator as the Tenths or Hundredths (for example, writing $\frac{1}{4}$ as 1.4).	How Much Rice?, More Cups of Rice, Groups of Hundredths, Practice, Check Your Understanding
	• Students may struggle to understand that the values of digits decrease as you move to the right of the decimal point because the word form appears to increase. For example, 2 Tenths is larger than 2 Hundredths.	Mystery Number, See and Say, Writing About Math, Practice, Check Your Understanding

Lesson Name	Materials for Lesson	Vocabulary Terms	Learning Objectives	
4 Decimals in Multiple Forms	- No additional materials needed	Expanded form Standard form Word form Unit form	- Students will write decimals to the Hundredths place in standard, word, unit, and expanded form.	
Concept Check-In and Remediation	- Materials may vary	Review concept vocabulary as needed.	- Students will work to correct misconceptions and errors related to identifying, reading, and writing decimals.	

Opportunities for Assessment:

In addition to the assessment opportunities included in this chart, each concept will include a Concept Check-In.

	Common Misconceptions and Errors	Opportunities for Formative Assessment
	• Students may struggle to understand that the values of digits decrease as you move to the right of the decimal point because the word form appears to increase. For example, 2 Tenths is larger than 2 Hundredths. • Students may confuse Tens with Tenths and Hundreds with Hundredths. They use a similar model in the decimal number lessons to the place value models used previously. However, the value and the vocabulary are different.	Error Analysis, Naming Decimals, Writing About Math, Practice, Check Your Understanding
	• Students may not understand that a decimal, like a fraction, is a number between two whole numbers. • Students tend to convert unit fractions to decimals using the denominator as reference (for example, $\frac{1}{5} = 0.5$). • Students may struggle to understand how to move between fractions and decimals using the numerator to represent the whole and the denominator as the Tenths or Hundredths (for example, writing $\frac{1}{4}$ as 1.4). • Students may struggle to understand that the values of digits decrease as you move to the right of the decimal point because the word form appears to increase. For example, 2 Tenths is larger than 2 Hundredths.	

UNIT 10

CONCEPT 1

Defining Decimals

LESSON 1
Let's Explore Decimals

Lesson Overview

In this lesson, students explore the relationship between fractions with denominators of 10 and decimal numbers. Lessons 1 and 2 of this unit focus specifically on helping students build conceptual understanding of decimals through the use of visual models. In subsequent lessons, students learn how decimals relate to whole numbers and to each other on the place value chart.

Lesson Essential Question

- How are decimals, fractions, and whole numbers similar and different?

Learning Objectives

In this lesson

- Students will define decimal fractions.
- Students will create visual models of Tenths.

Grade-Level Standards

4.A.3.a Read and write decimals to Hundredths using numerals, word form, and expanded form.

4.A.3.b Use models to illustrate and compare decimals to Hundredths.

4.B.2.b Use decimal notation for fractions with denominators 10 or 100 (for example, write $\frac{62}{100}$ as .62).

Vocabulary Check-In

decimal number, decimal fraction, decimal point, fraction, tenths

Materials List

- Meterstick
- Strip of paper, 1 meter long
- Colored markers or pencils
- Metric Conversion chart (from Unit 3)

Photo Credit: Elena Veselova / Shutterstock.com

DIGITAL

Lesson 1

Let's Explore Decimals

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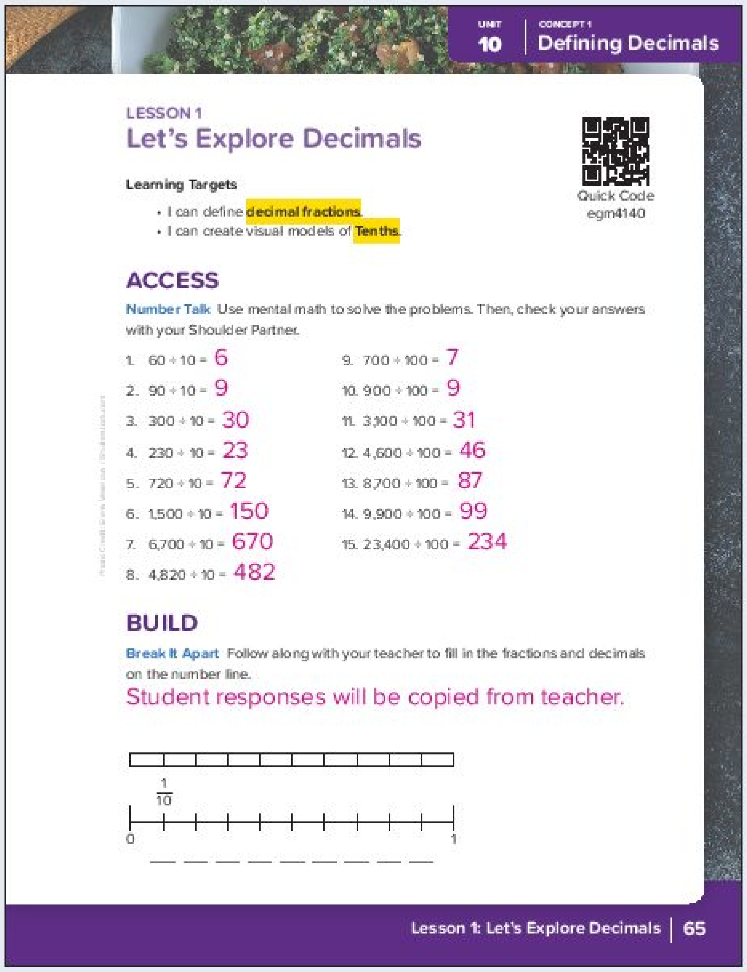
egmt4140

PRINT

Student Page 65



UNIT 10 | CONCEPT 1 Defining Decimals

LESSON 1

Let's Explore Decimals

Quick Code egm4140

Learning Targets

- I can define decimal fractions.
- I can create visual models of Tenths.

ACCESS

Number Talk Use mental math to solve the problems. Then, check your answers with your Shoulder Partner.

1. 60 ÷ 10 = 6
2. 90 ÷ 10 = 9
3. 300 ÷ 10 = 30
4. 230 ÷ 10 = 23
5. 720 ÷ 10 = 72
6. 1,500 ÷ 10 = 150
7. 6,700 ÷ 10 = 670
8. 4,820 ÷ 10 = 482
9. 700 ÷ 100 = 7
10. 900 ÷ 100 = 9
11. 3,100 ÷ 100 = 31
12. 4,600 ÷ 100 = 46
13. 8,700 ÷ 100 = 87
14. 9,900 ÷ 100 = 99
15. 23,400 ÷ 100 = 234

BUILD

Break It Apart Follow along with your teacher to fill in the fractions and decimals on the number line.

Student responses will be copied from teacher.

Lesson 1: Let's Explore Decimals | 65

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may not understand that a decimal, like a fraction, is a number between two whole numbers.
- Students tend to convert unit fractions to decimals using the denominator as reference (for example, $\frac{1}{5} = 0.5$).
- Students may struggle to understand how to move between fractions and decimals using the numerator to represent the whole and the denominator as the Tenths or Hundredths (for example, writing $\frac{1}{4}$ as 1.4).

Number Talk

1. Direct students to Lesson 1 ACCESS Number Talk.
2. Ask students to complete the problems and then check their answers with their Shoulder Partner.
3. Pose the following questions and discuss:

ASK

- *What do all of these division problems have in common?*
  Dividing by a power of 10; some are related to math facts
- *What strategies did you use to help you mentally solve these problems?*
  Students may mention using related math facts, place value, or patterns with zeroes; Accept any strategies that lead to a correct answer.

4. Explain to students that today they will divide a whole into 10 parts and 100 parts. They will also learn about numbers called decimals.

BUILD (40 min)

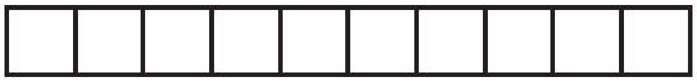
Break It Apart (25 min)

1. Display the Metric Conversion chart from Unit 3. Ask students to turn to Lesson 1 BUILD Break It Apart. Read the Learning Targets aloud with students.
2. Ask students to share what they remember about a meter, asking questions such as:

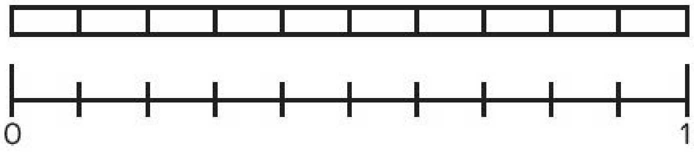
ASK

- *What do we use meters to measure?*
  length
- *What smaller units of measurement are part of a meter?*
  decimeters, centimeters, and millimeters
- *How many decimeters are in a meter? Centimeters in a meter? Millimeters in a meter?*
  10, 100, 1,000
- *How can we use fractions to express the relationship between 1 decimeter and 1 meter? One centimeter and 1 meter? One millimeter and 1 meter?*
  A decimeter is $\frac{1}{10}$ *of a meter, a centimeter is* $\frac{1}{100}$ *of a meter, and a millimeter is* $\frac{1}{1,000}$ *of a meter.*

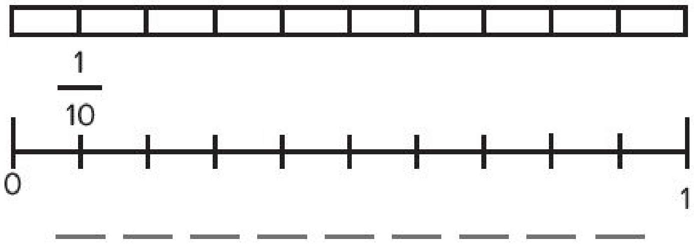
3. Use a meterstick to draw a 1-meter-long rectangle on the board and divide it into 10 equal parts as shown.



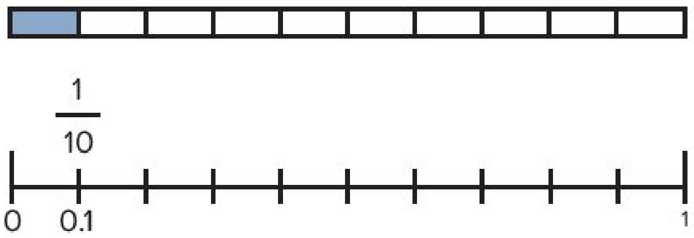
4. Draw a number line below the bar. Divide it into 10 equal sections and label 0 and 1 (see model). Tell students these models represent 1 meter.



5. Ask a volunteer to come to the front and color in the first box. Have students whisper what fraction of the meter is colored. $\frac{1}{10}$
6. Write $\frac{1}{10}$ above the number line.



7. Direct students to the first part of Lesson 1 BUILD Break It Apart. Guide students in recording the decimal 0.1 on the number line below the $\frac{1}{10}$ mark. Ask students to shade in $\frac{1}{10}$ of the bar model, as well.



8. Ask students to raise their hand if they have ever seen the number 0.1. Ask students to talk with their Shoulder Partner about what they know or notice about this number. Ask a few volunteers to share their thinking with the class.

9. Tell students this is a decimal number. Explain the following:

   - Decimals are numbers that represent values that are less than 1, but greater than 0.
   - Just as $\frac{1}{10}$ is one part of a whole that has been divided into ten equal parts, so is the decimal number 0.1.
   - The decimal number 0.1 is read as "one-tenth."
   - The zero before the decimal points means there are zero Ones.
   - We write the decimal form as zero point one and the dot is called a decimal point.
   - The fraction $\frac{1}{10}$ and the decimal number 0.1 are equivalent. The bar model shows us they have the same value.

10. Ask students to color in another tenth and to talk to a partner about what fraction of the meter is now shaded and what they think the decimal number is? $\frac{2}{10}$ and 0.2

11. Work with students to record the fraction above the number line and the decimal below the number line.

12. Repeat one tenth at a time until 0.5 of the meter is shaded in and the numbers are recorded.

13. Pose the following questions and discuss the answers as a group:

ASK

- *What fraction of the meter is now shaded?*
  $\frac{5}{10}$ *or* $\frac{1}{2}$
- *What decimal of the strip is shaded?*
  0.5
- *How many more tenths do we need to color to have* $\frac{8}{10}$ *in decimals and fractions?*
  0.3, $\frac{3}{10}$
- *How many more tenths do we need to have 1 meter or one whole in decimals and fractions?*
  0.5, $\frac{5}{10}$

14. Continue to model and have students color in the strip one-tenth at a time. After each tenth is shaded and recorded as a fraction and decimal, ask students to identify the fraction and the decimal.

15. When the last tenth of the bar is shaded, discuss the following questions:

ASK

- *What fraction could we record now that the entire meter bar is shaded?*
  $\frac{10}{10}$
- *Is there another way to represent* $\frac{10}{10}$*?*
  1 whole
- *How do you think we might represent 1 whole as a decimal?*
  1 or 1.0

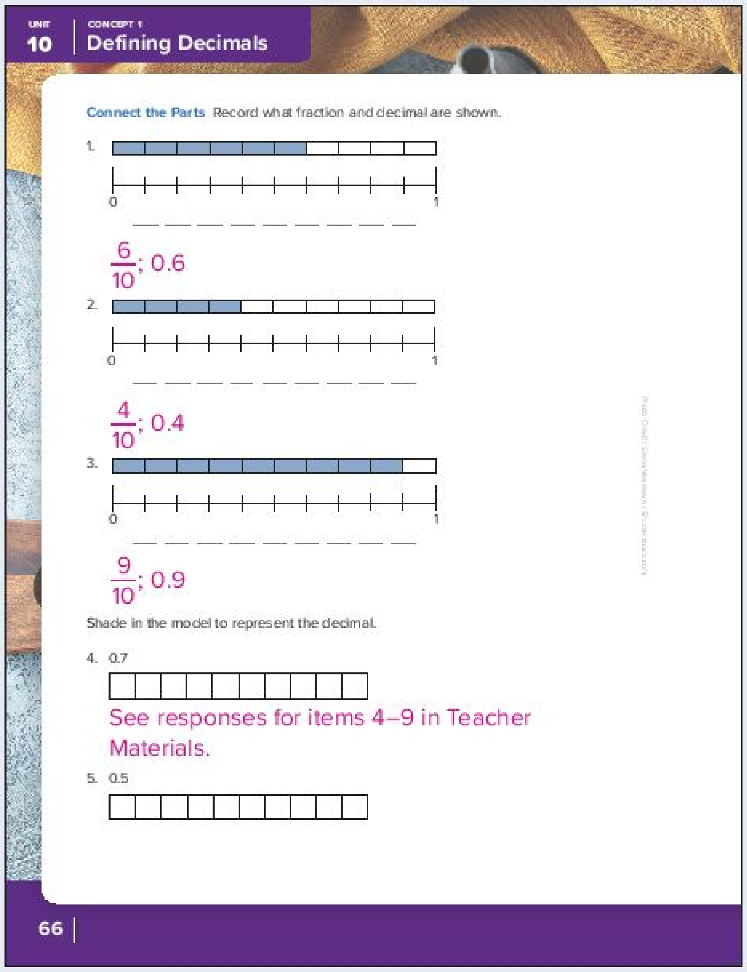
TEACHER NOTE: Moving from 0.9 to 1.0 can be a tricky concept, so ensure students understand that, just like fractions when you have 10 Tenths, it is equivalent to one whole. This will be reinforced in Lesson 3 and Lesson 4 when students look more closely at decimal place value.

Connect the Parts (15 min)

1. Direct students to Lesson 1 BUILD Connect the Parts to create models that represent fractions and decimals. Direct students to work either independently, with a partner, or in a small group with you, depending on the needs of your students.
2. When 5 minutes are left in BUILD, use an Attention-Getting Signal and review the answers. Clarify any problems or concepts, as needed. Reinforce that decimal fractions represent Tenths, or ten equal parts of a whole. Ensure students understand that regardless of the model's shape (squares or rectangles, for example), as long as the whole is divided into 10 equal parts, it represents Tenths.

PRINT

Student Page 66



UNIT 10 | CONCEPT 1 Defining Decimals

Connect the Parts Record what fraction and decimal are shown.

1\.

$\frac{6}{10}$; 0.6

2\.

$\frac{4}{10}$; 0.4

3\.

$\frac{9}{10}$; 0.9

Shade in the model to represent the decimal.

4. 0.7

See responses for items 4–9 in Teacher Materials.

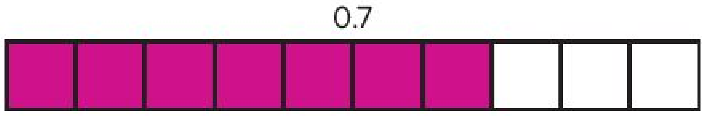
5. 0.5

66

Answer Key for Connect the Parts:

1. $\frac{6}{10}$; 0.6
2. $\frac{4}{10}$; 0.4
3. $\frac{9}{10}$; 0.9

4.



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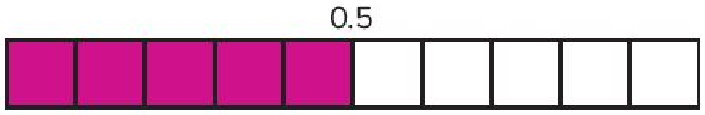

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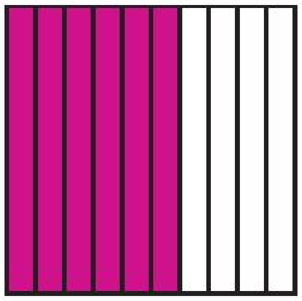

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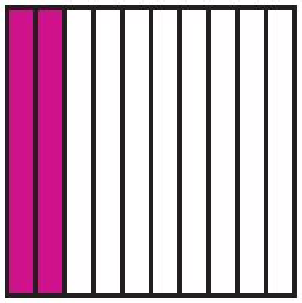

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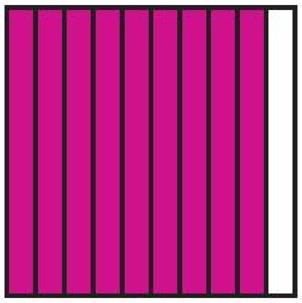

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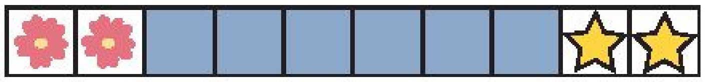


10. 0.2 of the strip has stars.

CONNECT (7 min)

Writing About Math

Ask students to turn to Lesson 1 CONNECT Writing About Math and respond to the prompt.

Answer Key for Writing About Math:
Answers will vary but should include something about how 0.1 represents $\frac{1}{10}$. 1 whole has been divided into ten parts and 0.1 represents that one part. May include visuals or may reference the meter bar used in class.

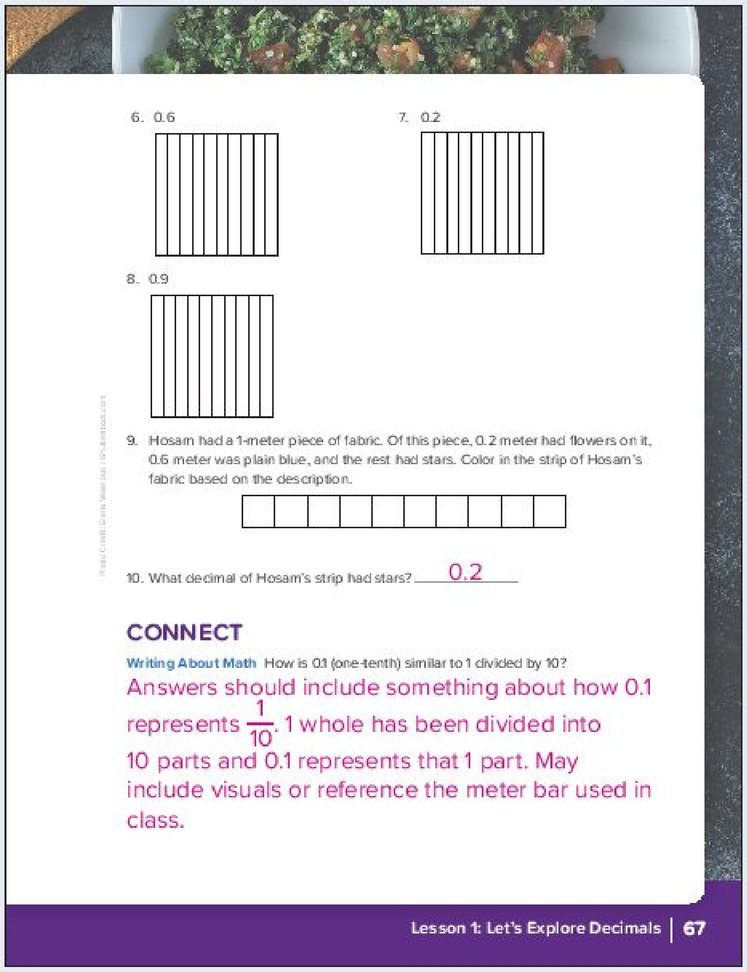
WRAP-UP (3 min)

Let's Chat About Our Learning

Ask volunteers to share their Writing About Math response. Encourage students to ask each other questions to help build their understanding of decimals, fractions, and whole numbers.

PRINT

Student Page 67



6. 0.6

7. 0.2

8. 0.9

9. Hosam had a 1-meter piece of fabric. Of this piece, 0.2 meter had flowers on it, 0.6 meter was plain blue, and the rest had stars. Color in the strip of Hosam's fabric based on the description.

10. What decimal of Hosam's strip had stars? 0.2

CONNECT

Writing About Math How is 0.1 (one-tenth) similar to 1 divided by 10?

Answers should include something about how 0.1 represents $\frac{1}{10}$. 1 whole has been divided into 10 parts and 0.1 represents that 1 part. May include visuals or reference the meter bar used in class.

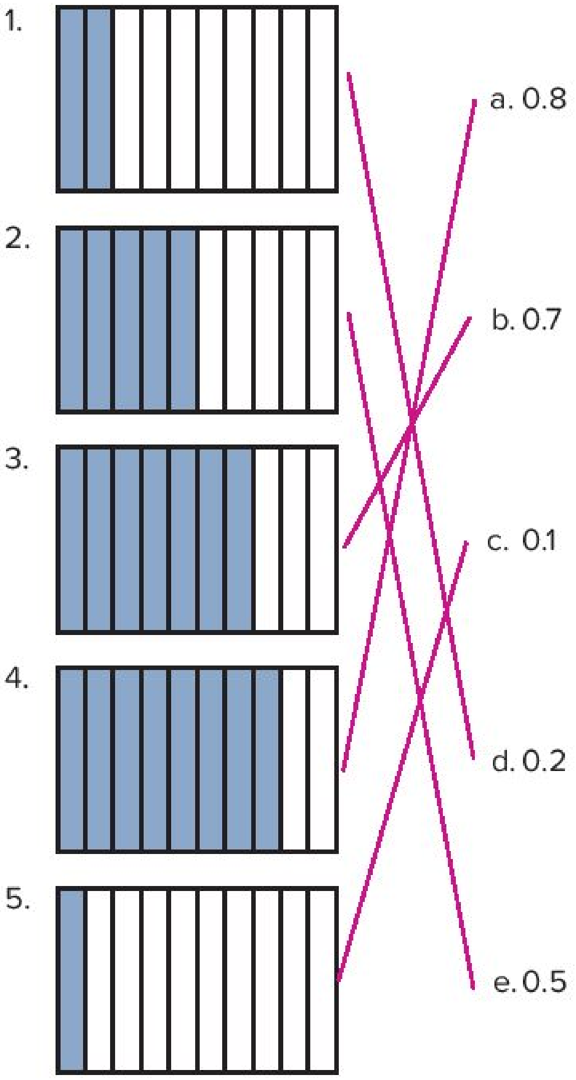
Lesson 1: Let's Explore Decimals | 67

PRACTICE

Direct students to Lesson 1 PRACTICE and have them complete the problems. Address student errors and misconceptions related to identifying and modeling decimals to the Tenths place.

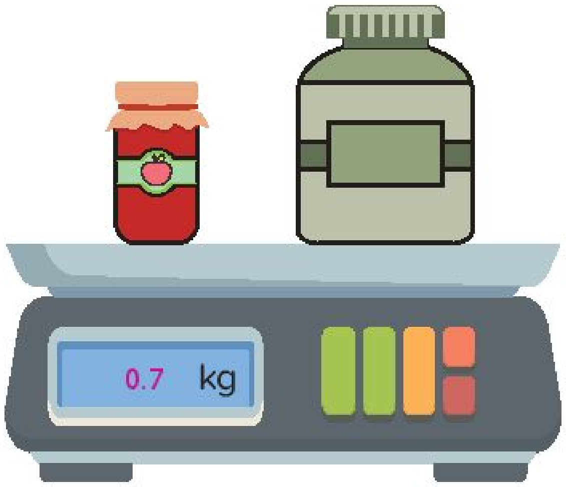
Check Your Understanding

Match the visual model to the correct decimal number.



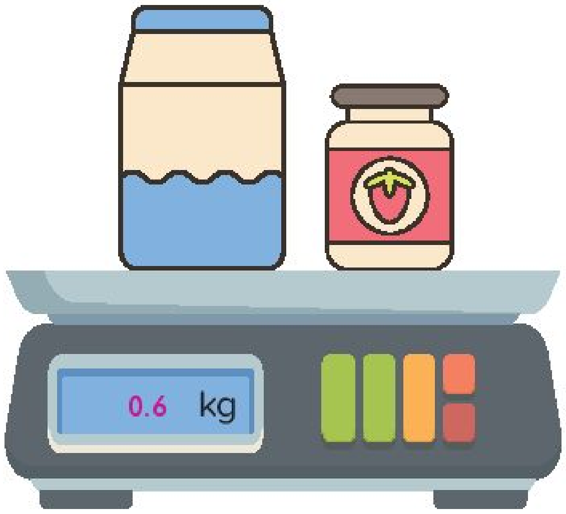
Check Your Understanding *(continued)*

6. Write the mass of the food on the scale in decimal form.



$\boxed{\frac{7}{10}\text{ kg}}$

7.



$\boxed{\frac{6}{10}\text{ kg}}$

LESSON 2

The Powerful 10

Lesson Overview

In this lesson, students continue to work with decimal fractions, expanding the focus to include numbers to the Hundredths place. Students continue to build understanding of decimal numbers through the use of visual models. This work helps to prepare students to build understanding of decimals on the place value chart.

Lesson Essential Question

- How are decimals, fractions, and whole numbers similar and different?

Learning Objective

In this lesson

- Students will create visual models of Hundredths.

Grade-Level Standards

4.A.3.a Read and write decimals to Hundredths using numerals, word form, and expanded form.

4.A.3.b Use models to illustrate and compare decimals to Hundredths.

4.B.2.b Use decimal notation for fractions with denominators 10 or 100 (for example, write $\frac{62}{100}$ as .62).

Vocabulary Check-In

hundredths, kilogram

Materials List

- Unit 10 Lesson 2 Hundredths Grid Model
- Unit 10 Lesson 2 Tenths and Hundredths Models (optional)
- Bag of rice, 1 kilogram
- Clear cups, 10
- Colored pencils or markers

Preparation

Use the Blackline Master of the Hundredths Grid Model at end of the volume to make multiple copies for teacher use or to create a transparency for an overhead projector. Pour 100 grams of rice into each cup and mark a line on the cups. Pour the rice back into the bag.

Photo Credit: SURAKIT SAWANGCHIT / Shutterstock.com

DIGITAL

Lesson 2

The Powerful 10

Quick Code:
egmt4141

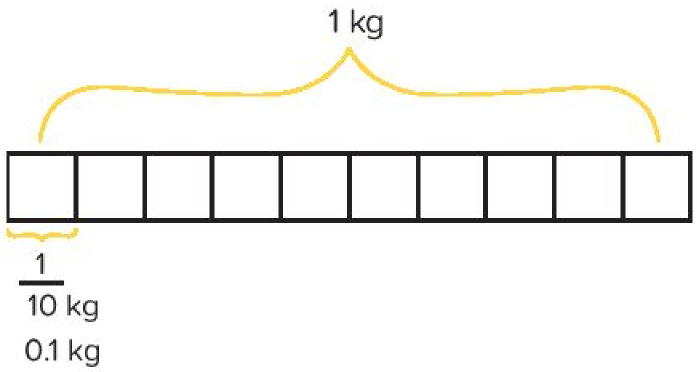
ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may not understand that a decimal, like a fraction, is a number between two whole numbers.
- Students tend to convert unit fractions to decimals using the denominator as reference (for example, $\frac{1}{5} = 0.5$).
- Students may struggle to understand how to move between fractions and decimals using the numerator to represent the whole and the denominator as the Tenths or Hundredths (for example, writing $\frac{1}{4}$ as 1.4).

How Much Rice?

1. Hold up a 1 kilogram bag of rice and ask, "If I had a bag of rice that weighed 1 kilogram, and wanted to split the bag equally among 10 cups, what fraction and decimal of the bag would be in each cup?"
$\frac{1}{10}$ and 0.1
2. Sketch a quick bar model similar to the one shown here and review from Lesson 1 how to record $\frac{1}{10}$ and 0.1.



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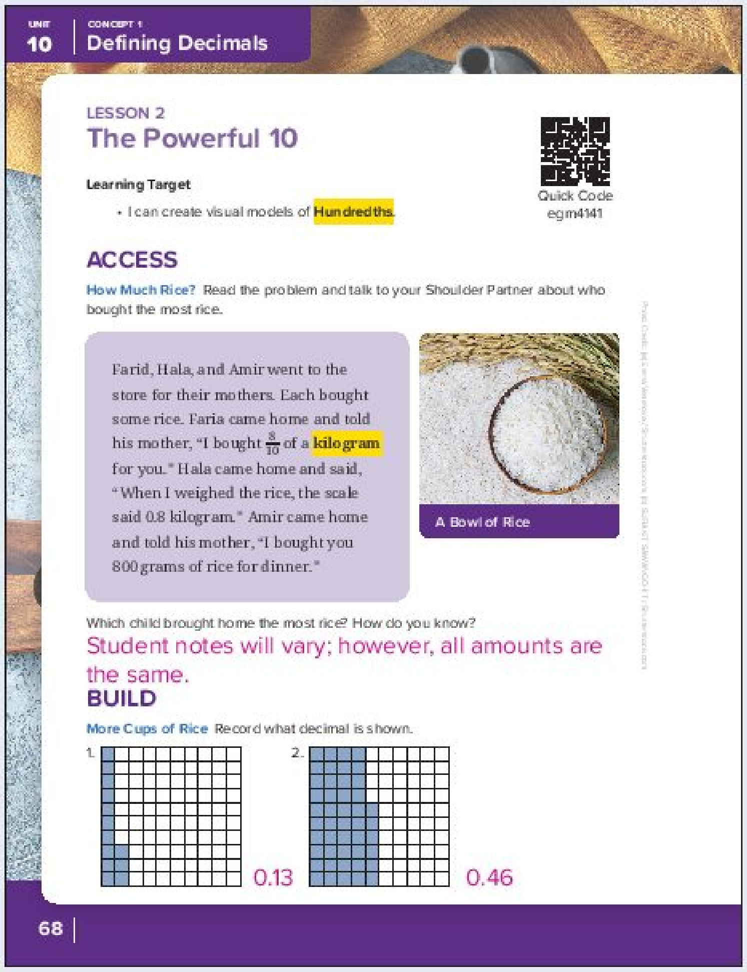
Student Page 68



UNIT 10 | CONCEPT 1 Defining Decimals

LESSON 2
The Powerful 10

Learning Target

- I can create visual models of Hundredths.

Quick Code
egm4141

ACCESS

How Much Rice? Read the problem and talk to your Shoulder Partner about who bought the most rice.

Farid, Hala, and Amir went to the store for their mothers. Each bought some rice. Faria came home and told his mother, "I bought $\frac{8}{10}$ of a kilogram for you." Hala came home and said, "When I weighed the rice, the scale said 0.8 kilogram." Amir came home and told his mother, "I bought you 800 grams of rice for dinner."

A Bowl of Rice

Which child brought home the most rice? How do you know?
Student notes will vary; however, all amounts are the same.

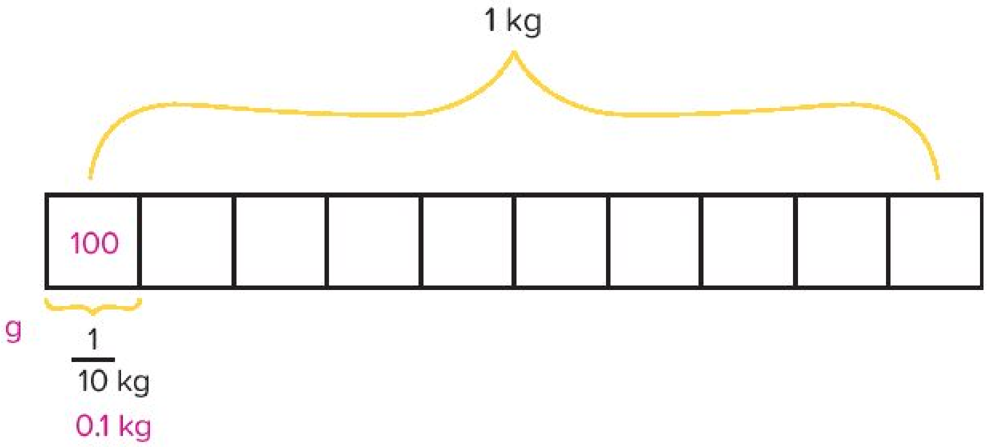
BUILD

More Cups of Rice Record what decimal is shown.

1. 0.13
2. 0.46

68

3. Pour the rice into 10 cups and ask the following question, "How many grams of rice are in each cup?" Record on the model, as shown. Review how many grams are in a kilogram, if necessary. 1,000 ÷ 10 = 100 grams



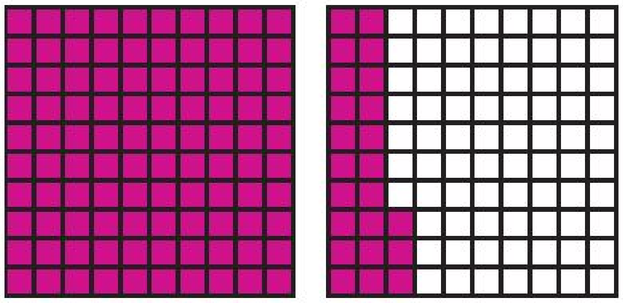
4. Direct students to Lesson 2 ACCESS How Much Rice?
5. Ask students to read the problem and talk to their Shoulder Partner about which student has the most rice.
6. After a few minutes, ask students to share their thinking. Use bar models to reinforce that all the students have the same amount of rice. 0.8 kilogram, $\frac{8}{10}$ kilogram, and 800 grams are the same amount. It is helpful to understand how fractions and decimals are related and will be further discussed in Concept 2.

BUILD (40 min)

More Cups of Rice

1. Direct students to Lesson 2 BUILD More Cups of Rice and read the Learning Targets.
2. Pose the following question, "If we poured the rice we used before into 100 cups instead of 10, what fraction of the bag of rice would each portion represent?" $\frac{1}{100}$
3. Display the Hundredths Grid Model and color in one of the squares. Ask students what they notice.
   Students should point out that the model (grid) has 100 squares—10 rows, 10 columns. They should notice that there is only one square colored in.
4. Explain to students that the Hundredths grid model shows one whole and that each square represents an equal part of the whole. Since the whole is divided into 100 equal squares, each square is $\frac{1}{100}$ of the whole. Ask students to imagine that the grid represents a whole bag of rice and each square represents a cup holding $\frac{1}{100}$ of the whole bag.
5. Review the definition of a decimal fraction and tell students that $\frac{1}{100}$ can also be written as a decimal fraction. Just like the metric measurement system, decimal fractions are powers of 10 (10, 100, 1,000).

6. Ask students to predict how to write $\frac{1}{100}$ as a decimal fraction. Call on volunteers to share their ideas. Record student ideas on the board.
7. Explain that just like $\frac{1}{10} = 0.1$ and we say the decimal as one-tenth, with $\frac{1}{100}$ we can write the decimal 0.01 and say one-hundredth.
8. Ask for a volunteer to come and color in six-hundredths of the Hundredths Grid Model on the board and record the decimal 0.06.
9. Color in another 10 squares and ask students identify what decimal is now shaded? 0.16
10. Repeat, coloring in another 22 squares, (0.38), 20 squares (0.58). 30 squares (0.88), and 11 squares (0.99).
11. Ask students to discuss what number would be recorded if the last square were colored in (1.0). Ask students to discuss how they know. (It is one whole because the whole grid is shaded in.) Explain that because the number is 1, it is written to the left of the decimal point.
12. Ask students how they would model one and twenty-three hundredths using the grid model. Allow students to share their thinking. Display two Hundredths grid models. Ask volunteers to shade in the models to show one and twenty-three hundredths. Clarify any misconceptions.



13. Direct students to spend the rest of the time working on Lesson 2 BUILD More Cups of Rice either independently, with partners, or in a small group, depending on their needs.

Answer Key for More Cups of Rice:

1. 0.13
2. 0.46
3. 0.98

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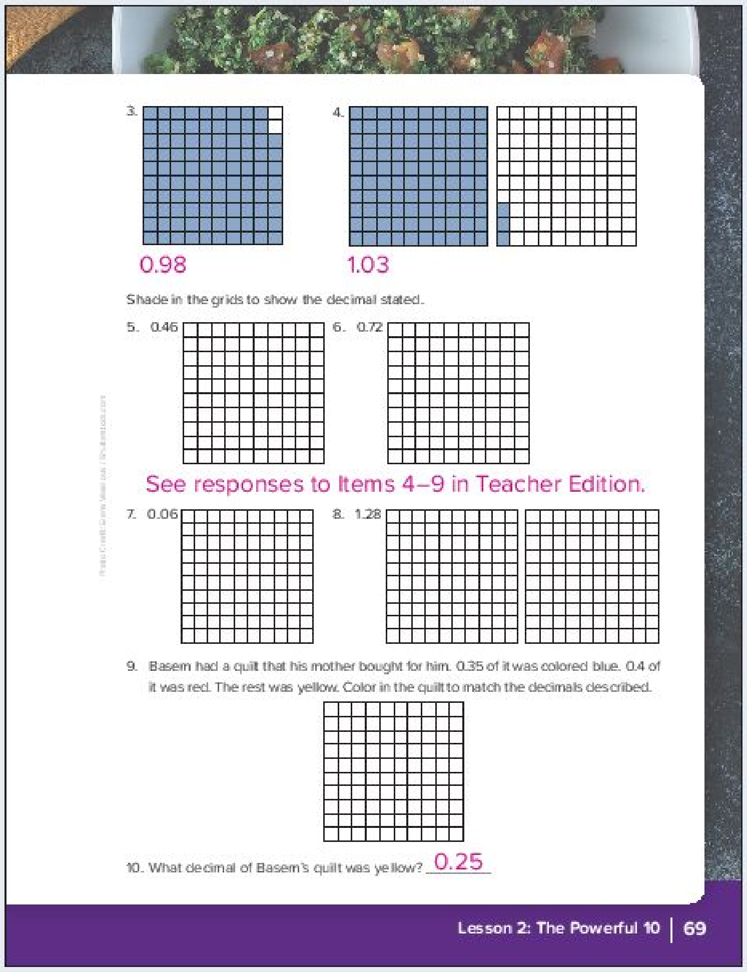


3. 0.98

4. 1.03

Shade in the grids to show the decimal stated.

5. 0.46

6. 0.72

See responses to Items 4–9 in Teacher Edition.

7. 0.06

8. 1.28

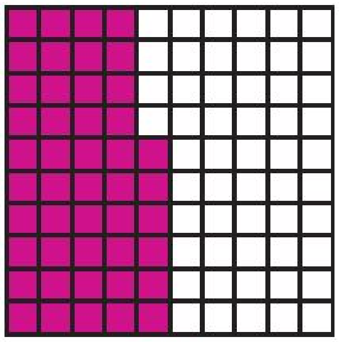
9. Basem had a quilt that his mother bought for him. 0.35 of it was colored blue. 0.4 of it was red. The rest was yellow. Color in the quilt to match the decimals described.

10. What decimal of Basem's quilt was yellow? 0.25

Lesson 2: The Powerful 10 | 69

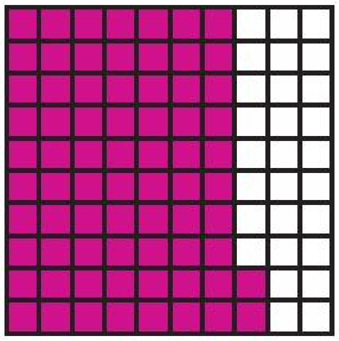
4. 1.03

5.



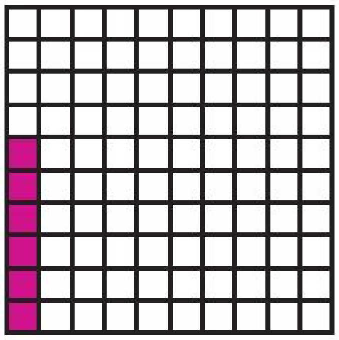
0.46

6.



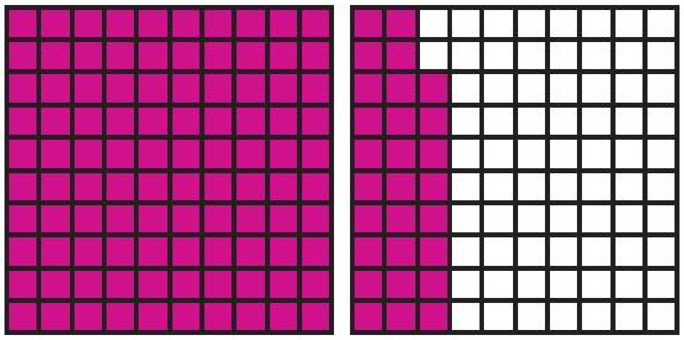
0.72

7.



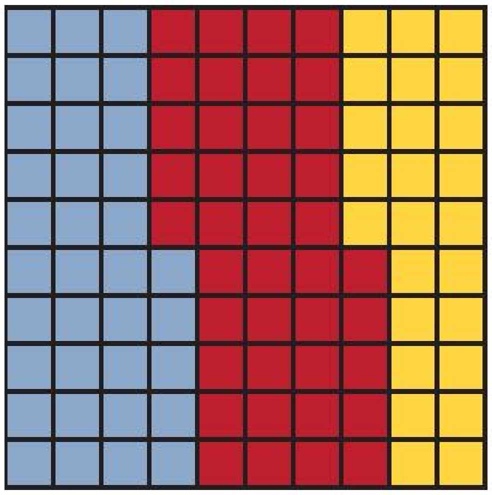
0.06

8.



1.28

9. It is acceptable for students to color the grid in any pattern as long as they color 35 squares blue, 40 squares red, and 25 squares yellow.



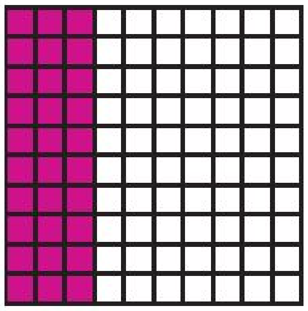
10. The quilt is 0.25 yellow.

CONNECT (7 min)

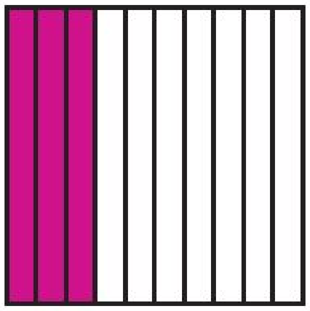
Groups of Hundredths

Ask students to turn to Lesson 2 CONNECT Groups of Hundredths and respond to the questions.

Answer Key for Groups of Hundredths:
Both models have the same amount colored in. It takes 10 Hundredths to make 1 Tenth so 30 Hundredths will make 3 Tenths of the whole.



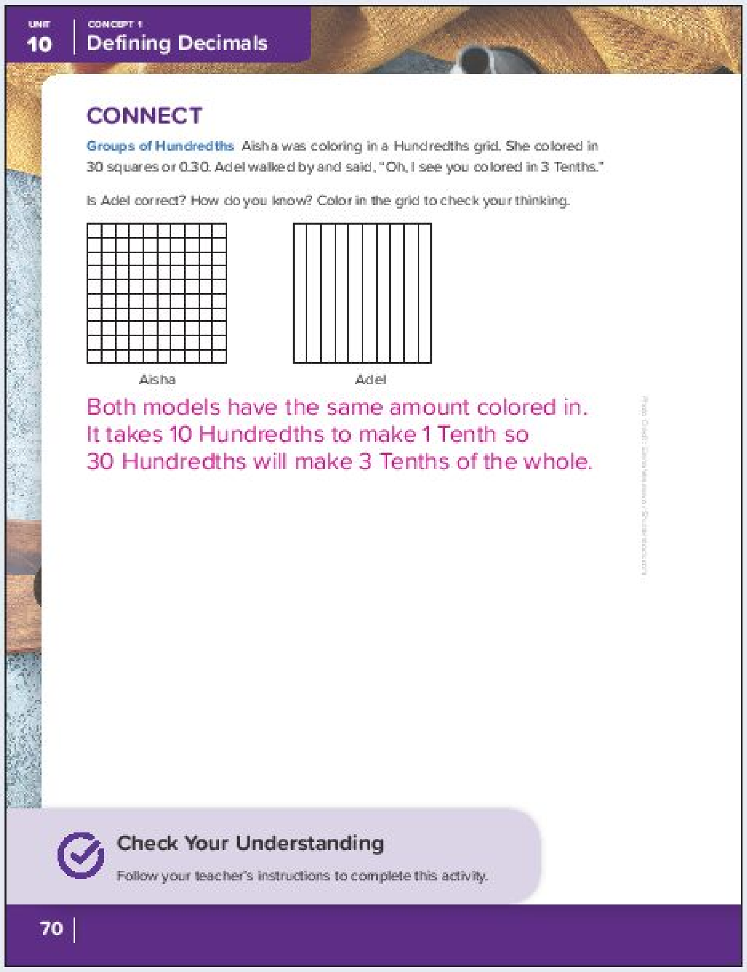
Aisha



Adel

PRINT

Student Page 70



UNIT 10 | CONCEPT 1 Defining Decimals

CONNECT

Groups of Hundredths Aisha was coloring in a Hundredths grid. She colored in 30 squares or 0.30. Adel walked by and said, "Oh, I see you colored in 3 Tenths."

Is Adel correct? How do you know? Color in the grid to check your thinking.

Aisha

Adel

Both models have the same amount colored in.
It takes 10 Hundredths to make 1 Tenth so
30 Hundredths will make 3 Tenths of the whole.

Check Your Understanding
Follow your teacher's instructions to complete this activity.

70

WRAP-UP (3 min)

Let's Chat About Our Learning

Ask students to share their responses to the Groups of Hundredths questions and to model their thinking on the board. Encourage students to ask each other questions to help build understanding.

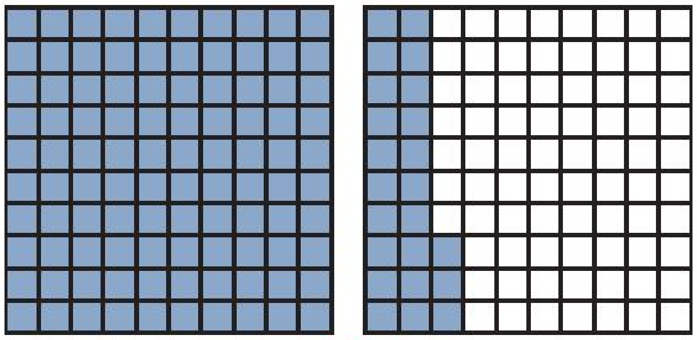
PRACTICE

Direct students to Lesson 2 PRACTICE and have them complete the problems. Address student errors and misconceptions related to identifying and modeling decimals to the Hundredths place.

Check Your Understanding

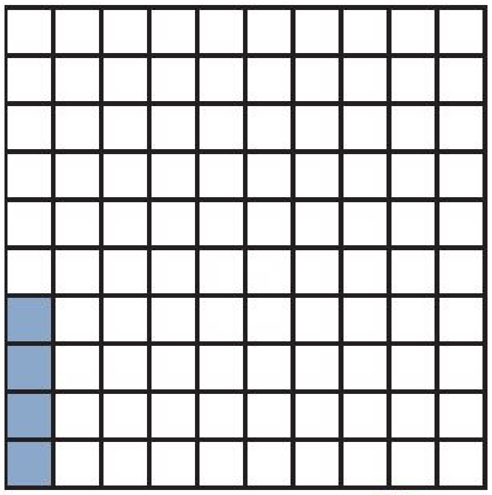
Circle the decimal that matches the models.

1.



123.00 [✓ 1.23] 12.3

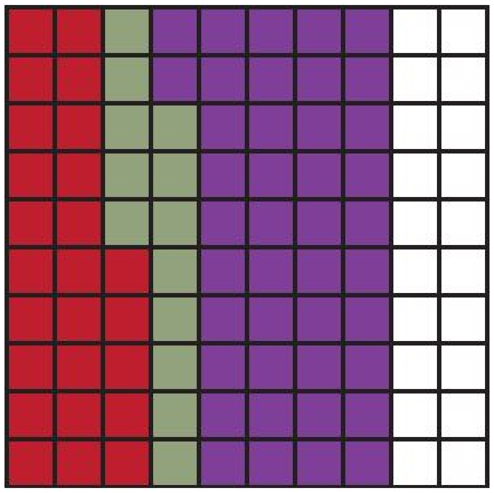
2.



0.4 4.0 [✓ 0.04]

3. Create a model according to the directions.

0.25 RED 0.13 GREEN 0.42 PURPLE



Accept any version with the correct Hundredths colored in.

4. What decimal of the grid in Problem 3 is NOT colored in?
0.20 is not colored in.

Materials List

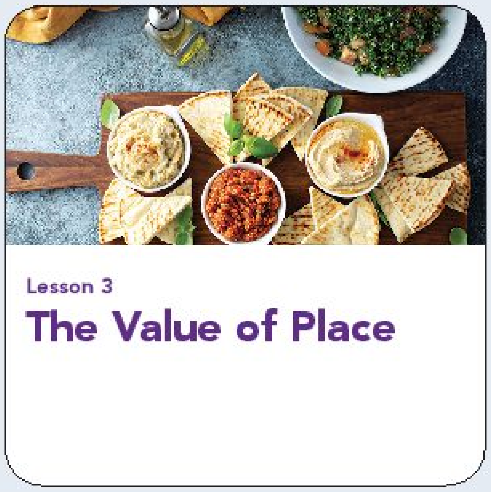
- Digit Cards 0–9

Preparation

Reuse Digit Cards from Unit 1.

Photo Credit: Elena Veselova / Shutterstock.com

DIGITAL



Lesson 3

The Value of Place

Quick Code:
egmt4142

LESSON 3
The Value of Place

Lesson Overview

In this lesson, students use different methods to practice naming, reading, and identifying the value of digits to the Hundredths place. They review whole number place value and expand to include decimals. Students discuss how decimal numbers like 50 Hundredths and 5 Tenths are the same and why. Students then practice reading and writing decimals in multiple forms.

Lesson Essential Question

- How are decimals, fractions, and whole numbers similar and different?

Learning Objectives

In this lesson

- Students will name the place values of decimals to the Hundredths place.
- Students will identify the value of a digit to the Hundredths place.

Grade-Level Standard

4.A.3.a Read and write decimals to Hundredths using numerals, word form, and expanded form.

Vocabulary Check-In

hundredths, place value, tenths

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may struggle to understand that the values of digits decrease as you move to the right of the decimal point because the word form appears to increase. For example, 2 Hundredths is larger than 2 Thousandths.

Mystery Number

1. Direct students to Lesson 3 ACCESS and chorally read the Learning Targets.
2. Work with students to solve Problem 1. Model using Think Aloud and place value strategies. Encourage students to share their thinking and problem-solving strategies. Review vocabulary as needed and clear up misconceptions before moving on.
3. Ask students to work with their Shoulder Partner to solve Problem 2. After a couple minutes, ask volunteers to share their answers and model their problem-solving strategies on the board.

Answer Key for Mystery Number:

1. 34,520
2. 3.21

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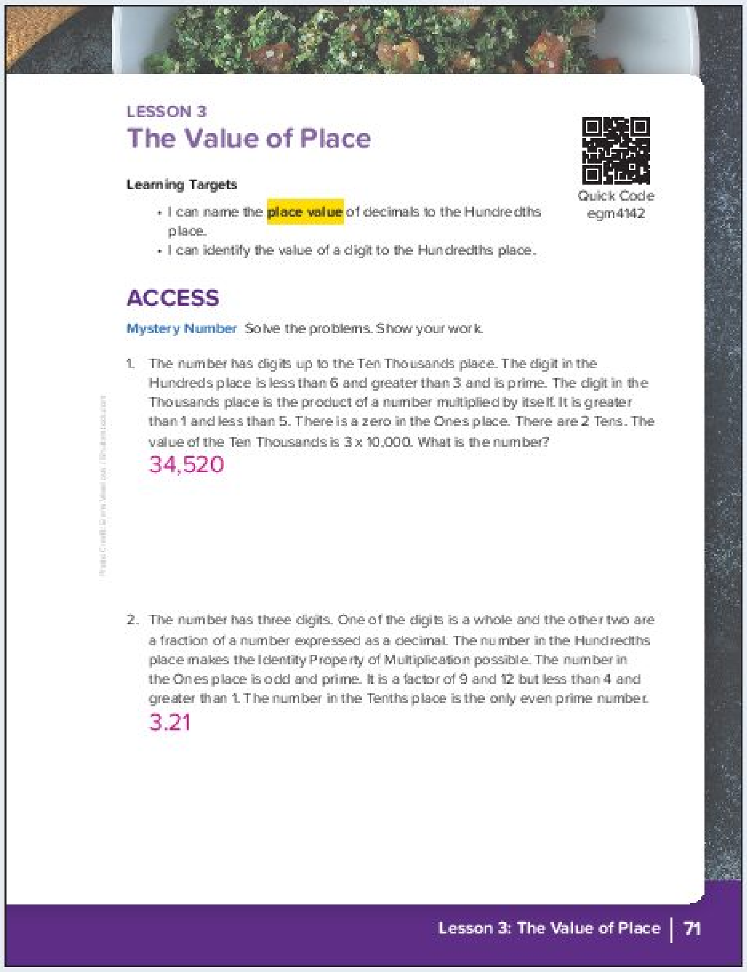
Student Page 71



LESSON 3

The Value of Place

Quick Code
egm4142

Learning Targets

- I can name the place value of decimals to the Hundredths place.
- I can identify the value of a digit to the Hundredths place.

ACCESS

Mystery Number Solve the problems. Show your work.

1. The number has digits up to the Ten Thousands place. The digit in the Hundreds place is less than 6 and greater than 3 and is prime. The digit in the Thousands place is the product of a number multiplied by itself. It is greater than 1 and less than 5. There is a zero in the Ones place. There are 2 Tens. The value of the Ten Thousands is 3 x 10,000. What is the number?
34,520

2. The number has three digits. One of the digits is a whole and the other two are a fraction of a number expressed as a decimal. The number in the Hundredths place makes the Identity Property of Multiplication possible. The number in the Ones place is odd and prime. It is a factor of 9 and 12 but less than 4 and greater than 1. The number in the Tenths place is the only even prime number.
3.21

Lesson 3: The Value of Place | 71

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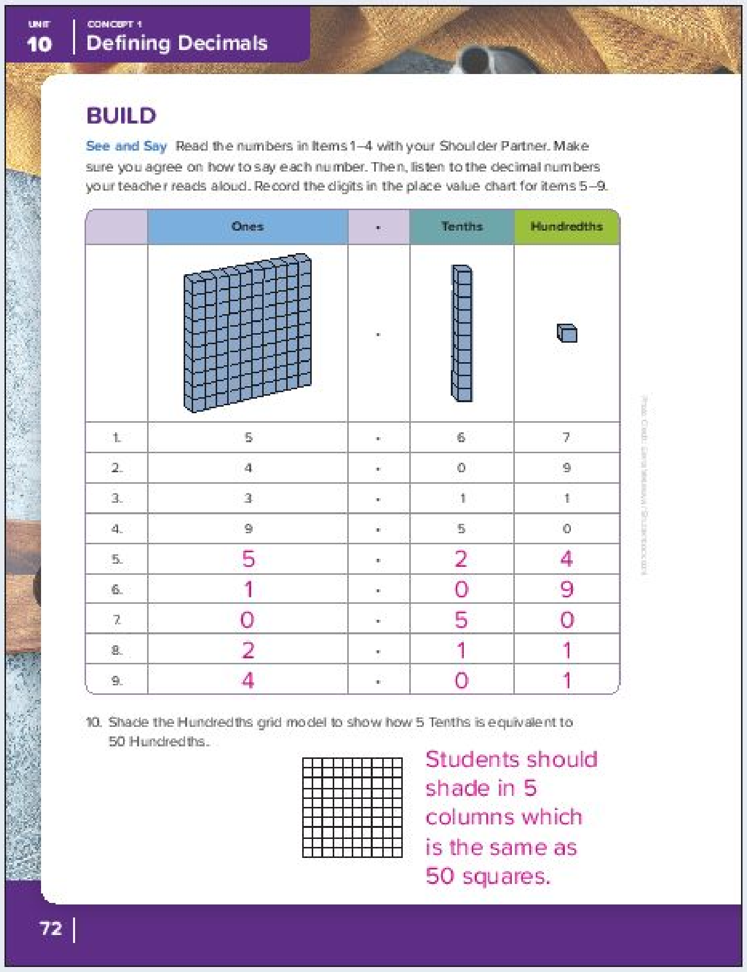
Student Page 72



UNIT 10 | CONCEPT 1 **Defining Decimals**

BUILD

See and Say Read the numbers in Items 1–4 with your Shoulder Partner. Make sure you agree on how to say each number. Then, listen to the decimal numbers your teacher reads aloud. Record the digits in the place value chart for items 5–9.

	Ones	.	Tenths	Hundredths
		.		
1.	5	.	6	7
2.	4	.	0	9
3.	3	.	1	1
4.	9	.	5	0
5.	5	.	2	4
6.	1	.	0	9
7.	0	.	5	0
8.	2	.	1	1
9.	4	.	0	1

10. Shade the Hundredths grid model to show how 5 Tenths is equivalent to 50 Hundredths.

Students should shade in 5 columns which is the same as 50 squares.

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BUILD (40 min)

See and Say (25 min)

1. Remind students that the decimal system is a number system based on tens. Ask the class the following questions and write the answers on the board:

ASK
- *How many Tenths make one whole?*
  10 Tenths = 1 whole
- *How many Hundredths make one whole?*
  100 Hundredths = 1 whole
- *How many Hundredths make one Tenth?*
  10 Hundredths = 1 Tenth

2. Ask students if they find anything confusing about these relationships. Discuss.
Students may mention that it is confusing that it takes multiple Hundredths to make a Tenth or multiple Tenths to make a whole, since those place names sound like the whole number place values Tens and Hundreds.

3. Tell students that today they will practice reading decimal numbers up to the Hundredths place. Emphasize that decimal place values sound like whole number place values, but are not the same. The place value names we will discuss are Tenths and Hundredths.

4. Draw a place value chart on the board that shows Ones, Tenths, and Hundredths as shown.

Ones	**.**	**Tenths**	**Hundredths**

5. Explain that reading decimals is like reading whole numbers. We start from left and move to the right. When we see the decimal point, we say the word "and." Then we read the number to the right of the decimal and end it by saying the place value of the last digit. Add the information to the place value chart on the board.

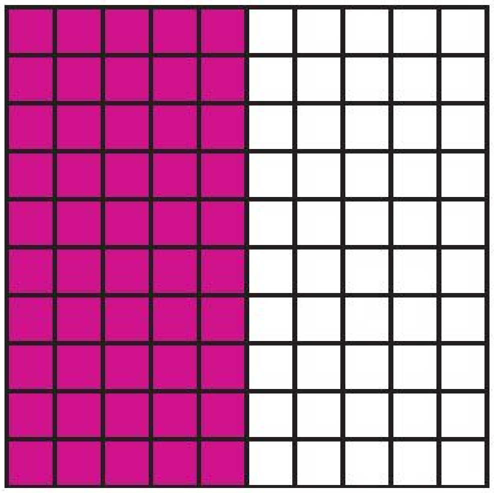
←Whole numbers	**and**	**Decimal numbers →**	
Ones	**.**	**Tenths**	**Hundredths**

6. Ask students to turn to Lesson 3 BUILD See and Say and look at the model at the top of the table.
7. Ask students to talk to their Shoulder Partner about how the model shows how one whole can be broken into Tenths and Hundredths. Remind students that these models are similar to the models they used when they studied whole number place value.
8. Ask students to share their thinking.
   Students should see that the 1 in the Ones place is represented by one whole square, similar to the Hundredths grid from the previous lesson. This square is broken into 100 smaller units in rows and columns of 10. The smallest unit is equal to $\frac{1}{100}$ of the whole. Each row or column of 10 is equal to $\frac{1}{10}$ of the whole.
9. Ask volunteers to read the number aloud. Ask students who read the number correctly to explain how they knew how to read the number.
   Students should read the number as "five and sixty-seven hundredths."
10. Repeat the process with Problems 2–5.
11. Tell students that you will read numbers aloud and they will fill in the table with the correct digits.
12. Read the following decimal numbers out loud:
    - five and twenty-four hundredths
    - one and nine-hundredths
    - five-tenths or fifty-hundredths
    - two and eleven-hundredths
    - four and one-hundredth
13. Review the answers as a class and clear up any misconceptions. If time allows, ask students to create a number for the class to record.

Answer Key for See and Say:

1. Five and sixty-seven hundredths
2. Four and nine-hundredths
3. Three and eleven-hundredths
4. Nine and five-tenths or nine and fifty-hundredths
5. 5.24
6. 1.09
7. 0.50
8. 2.11
9. 4.01

10.



Make and Say (15 min)

1. Ask students to turn to Lesson 3 BUILD Make and Say and take out their Digit Cards 0–9.

2. Tell students that they will practice building and reading decimal numbers with their Shoulder Partner.

3. Review the directions:

    - Put the two decks of digit cards together. Shuffle them and place them face down in a pile.
    - Turn over three cards.
    - Work together to arrange the cards to make and record as many different numbers as you can by writing the digits in the Ones, Tenths, and Hundredths places.
    - Record each number.
    - Practice saying the numbers with your partner.

4. Refer students to the example problem if they are confused.

5. As students play, walk around the room and ask student pairs to read you some of the numbers they have written.

6. Use the last 5 minutes of BUILD to call on partners to read one of their to the class. Write the numbers on the board as they say them to check their work and reinforce today's Learning Targets.

CONNECT (7 min)

Writing About Math

Direct students to Lesson 3 CONNECT Writing About Math to answer the questions.

Answer Key for Writing About Math:

1. 30
2. 9
3. 500
4. 8
5. There are 10 Tens in 1 Hundred, but when we look at decimals, we are breaking a number into smaller pieces. There are more pieces when a number is broken into Hundredths, so the value of each one of the pieces is less than the value of a Tenth.

TEACHER NOTE: This activity can be used as a formative assessment to see where students are still struggling.

WRAP-UP (3 min)

Let's Chat About Our Learning

Ask volunteers to share their answers to the questions in Writing About Math. Focus on the last question to determine how well students understand the place value of digits in whole numbers and decimal numbers.

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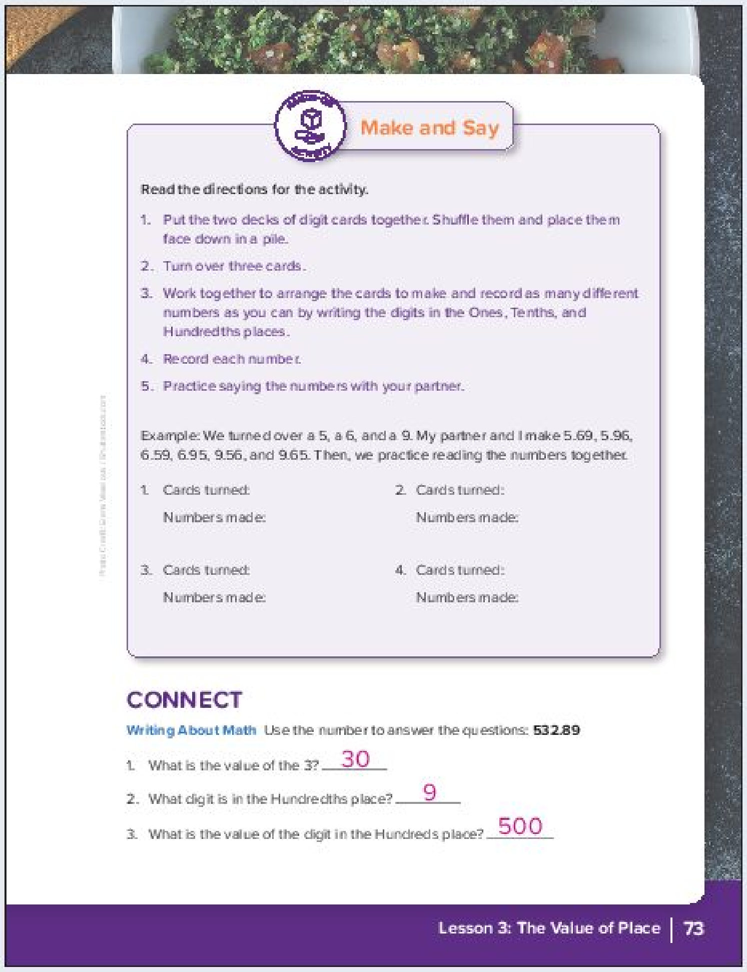
Student Page 73



Make and Say

Read the directions for the activity.

1. Put the two decks of digit cards together. Shuffle them and place them face down in a pile.
2. Turn over three cards.
3. Work together to arrange the cards to make and record as many different numbers as you can by writing the digits in the Ones, Tenths, and Hundredths places.
4. Record each number.
5. Practice saying the numbers with your partner.

Example: We turned over a 5, a 6, and a 9. My partner and I make 5.69, 5.96, 6.59, 6.95, 9.56, and 9.65. Then, we practice reading the numbers together.

1. Cards turned:
   Numbers made:
2. Cards turned:
   Numbers made:
3. Cards turned:
   Numbers made:
4. Cards turned:
   Numbers made:

CONNECT

Writing About Math Use the number to answer the questions: **532.89**

1. What is the value of the 3? 30
2. What digit is in the Hundredths place? 9
3. What is the value of the digit in the Hundreds place? 500

Lesson 3: The Value of Place | 73

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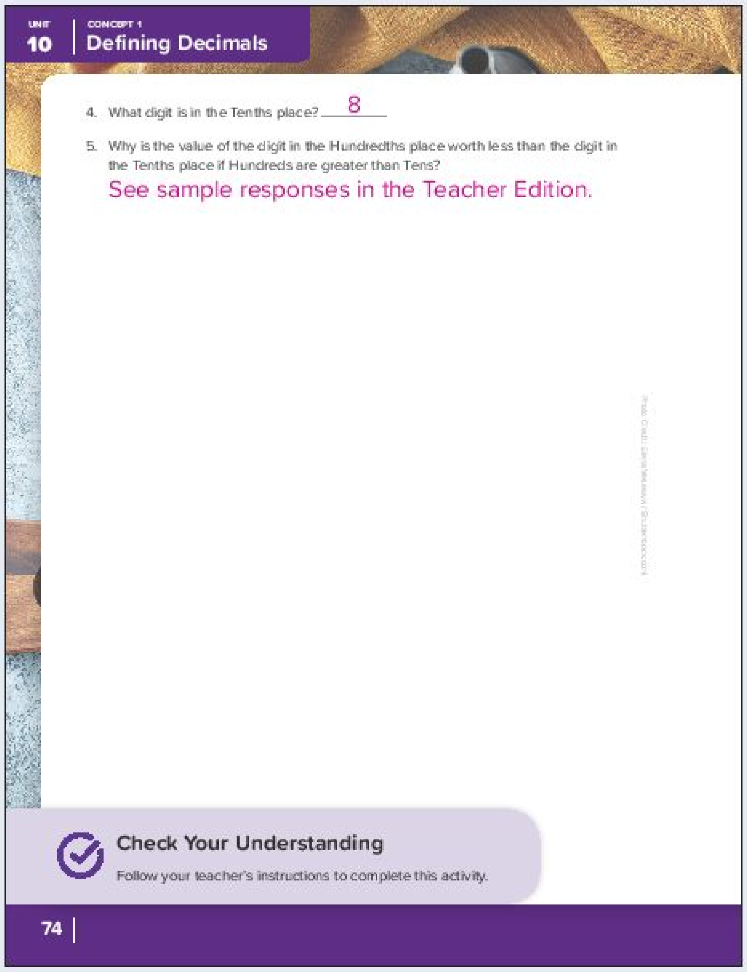
Student Page 74



UNIT 10 CONCEPT 1 **Defining Decimals**

4. What digit is in the Tenths place? 8

5. Why is the value of the digit in the Hundredths place worth less than the digit in the Tenths place if Hundreds are greater than Tens?

See sample responses in the Teacher Edition.

Check Your Understanding

Follow your teacher's instructions to complete this activity.

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PRACTICE

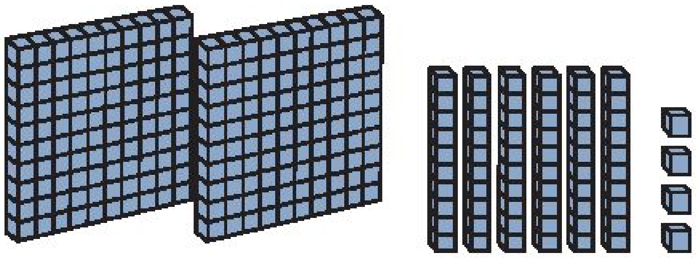
Direct students to Lesson 3 PRACTICE and have them complete the problems. Address student errors and misconceptions related to reading and writing decimal numbers to the Hundredths place.

Check Your Understanding

1. Write two numbers that have forty Tenths.
   Answers will vary but both numbers should have a 4 in the Tenths place.
2. Write three numbers that are greater than 1 and less than 2. Each number should have digits in the Tenths and Hundredths place.
   Answers will vary, but students' numbers should have a 1 in the Ones place and digits in the Tenths and Hundredths place.

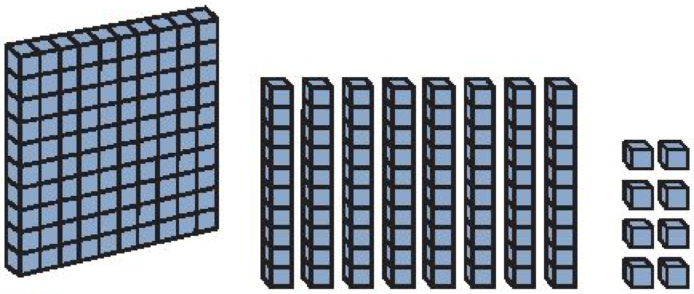
Write the number shown in each model.

3.



2.64

4.



1.88

LESSON 4
Decimals in Multiple Forms

Lesson Overview

In this lesson, students practice writing decimals to the Hundredths place in standard, unit, word, and expanded forms. They use models to help compare decimals.

Lesson Essential Question

- How are decimals, fractions, and whole numbers similar and different?

Learning Objective

In this lesson

- Students will write decimals to the Hundredths place in standard, word, unit, and expanded form.

Grade-Level Standard

4.A.3.a Read and write decimals to Hundredths using numerals, word form, and expanded form.

Vocabulary Check-In

expanded form, standard form, word form, unit form

Materials List

- No additional materials needed

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DIGITAL

Lesson 4

Decimals in Multiple Forms

Quick Code:
egmt4143

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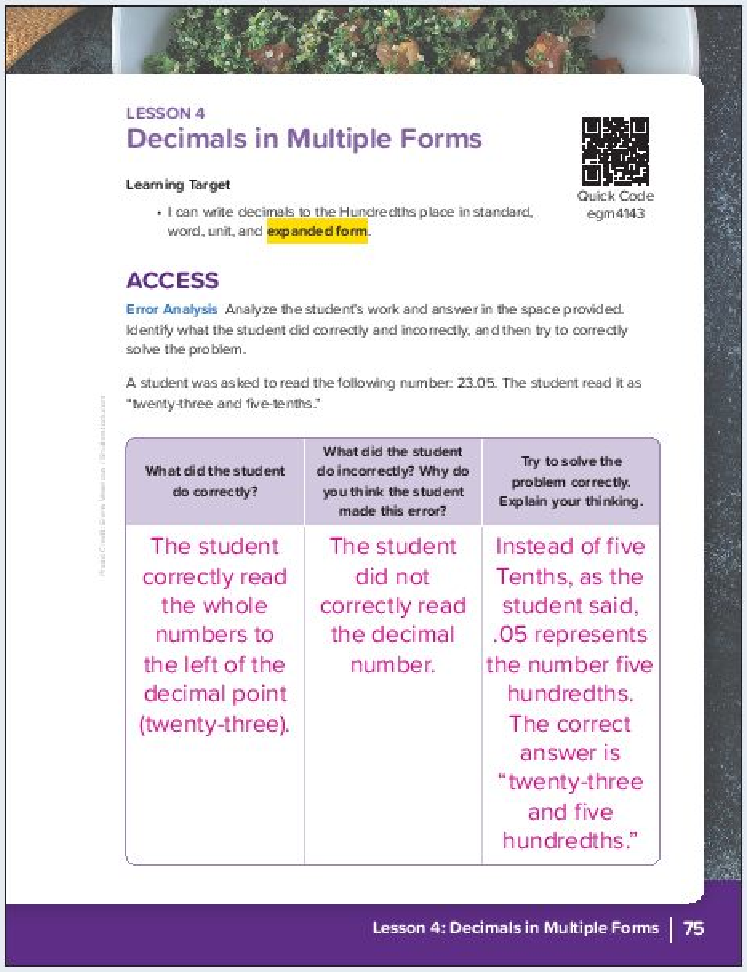
Student Page 75



LESSON 4

Decimals in Multiple Forms

Quick Code
egm4143

Learning Target

- I can write decimals to the Hundredths place in standard, word, unit, and expanded form.

ACCESS

Error Analysis Analyze the student's work and answer in the space provided. Identify what the student did correctly and incorrectly, and then try to correctly solve the problem.

A student was asked to read the following number: 23.05. The student read it as "twenty-three and five-tenths."

What did the student do correctly?	What did the student do incorrectly? Why do you think the student made this error?	Try to solve the problem correctly. Explain your thinking.
The student correctly read the whole numbers to the left of the decimal point (twenty-three).	The student did not correctly read the decimal number.	Instead of five Tenths, as the student said, .05 represents the number five hundredths. The correct answer is "twenty-three and five hundredths."

Lesson 4: Decimals in Multiple Forms | 75

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may struggle to understand that the values of digits decrease as you move to the right of the decimal point because the word form appears to increase. For example, 2 Hundredths is larger than 2 Thousandths.
- Students may confuse Tens with Tenths and Hundreds with Hundredths. They use a similar model in the decimal number lessons to the place value models used previously. However, the value and the vocabulary are different.

Error Analysis

1. Ask students to turn to Lesson 4 ACCESS Error Analysis and complete the error analysis activity.
2. After a few minutes, ask students to share their answers to the error analysis problem.

Answer Key for Error Analysis:
Students should point out that the student correctly read the whole numbers to the left of the decimal point (twenty-three) but did not correctly read the decimal number. Instead of five-tenths, as the student said, .05 represents the number five-hundredths.

TEACHER NOTE: This is a good opportunity to discuss what it means to have a 0 in the Tenths place. Students may be confused by having a 0 to the left of the digit 5. Remind them that Hundredths are smaller than Tenths. There are not enough Hundredths in this number to make a Tenth as there are 10 Hundredths in a Tenth and this number only has 5.

BUILD (40 min)

Naming Decimals

1. Direct students to Lesson 4 BUILD Naming Decimals and chorally read the Learning Targets.
2. Ask students to talk to their Shoulder Partner about what they remember about writing numbers in standard, word, and expanded form.
3. Call on students to share their thinking. Reinforce that standard form is written with digits; word form writes out the numbers in words as we read them; and expanded form shows the value of each digit and is written as an addition expression. Explain that writing decimals in different forms is very similar.
4. Tell students that they will also practice "unit form." In this form, each place value is stated. For example, 4.23 is written as 4 Ones, 2 Tenths, 3 Hundredths.
5. Review the example problem with the students. Ask students to give a Thumbs Up if they understand and are ready to begin. If students need additional support, do a few sample problems together as a whole class or in a small group.
6. Ask students to complete Problems 1–3. Check answers together. Repeat for Problems 4–6, 7–9, and 10–12. Take time to clear up misconceptions, particularly around using zeroes in numbers to make sure digits have the correct place values.
7. Direct students' attention to the next example problem in their Student Materials. Tell students that for the last three problems, they will be combining all the forms they have learned to rename decimal models.
8. Discuss the example with students and the place value models. The models will be familiar to students, but now they represent different values. Make sure students understand this before moving on.
9. Ask students to complete Problems 13–15. After a few minutes, go over the answers together.

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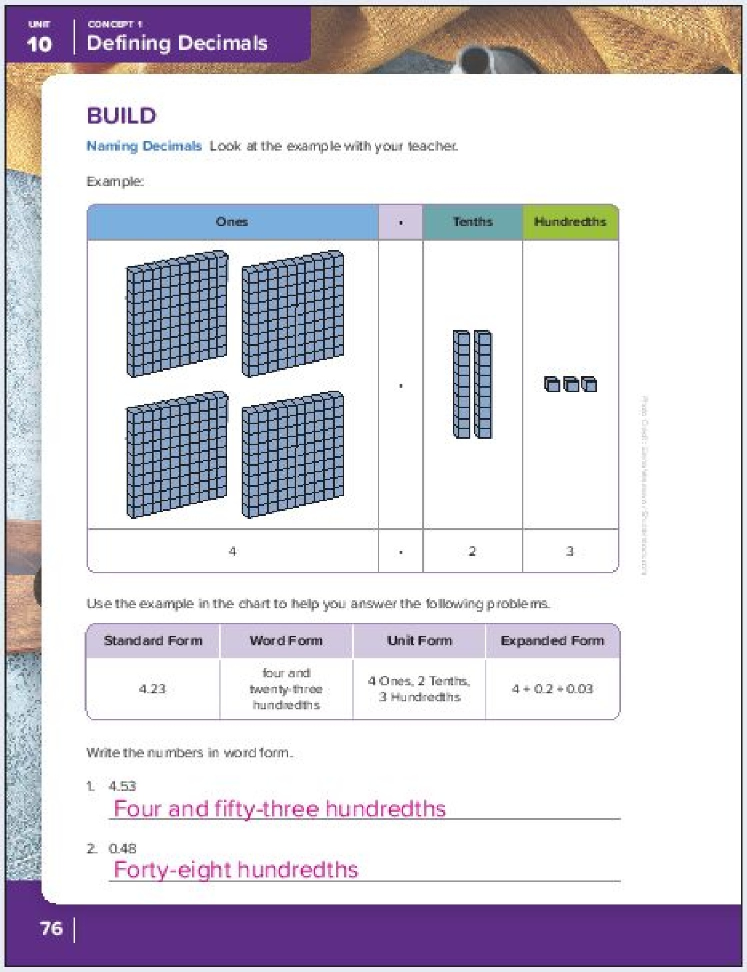

UNIT 10 | CONCEPT 1 Defining Decimals

BUILD

Naming Decimals Look at the example with your teacher.

Example:

Ones	.	Tenths	Hundredths
4	.	2	3

Use the example in the chart to help you answer the following problems.

Standard Form	Word Form	Unit Form	Expanded Form
4.23	four and twenty-three hundredths	4 Ones, 2 Tenths, 3 Hundredths	4 + 0.2 + 0.03

Write the numbers in word form.

1. 4.53
Four and fifty-three hundredths

2. 0.48
Forty-eight hundredths

76

PRINT

Student Page 77

3. 2 + 0.1 + 0.03
Two and thirteen-hundredths

Write the numbers in unit form.

4. 4.52
4 Ones, 5 Tenths, 2 Hundredths

5. seven and thirty-four hundredths
7 Ones, 3 Tenths, 4 Hundredths

6. sixty-nine hundredths
6 Tenths, 9 Hundredths

Write the numbers in expanded form.

7. 2.04
2 + 0.04

8. two and fifty-Hundredths
2 + 0.5

9. 5 Ones, 6 Tenths, 8 Hundredths
5 + 0.6 + 0.08

Write the numbers in standard form.

10. 7 Ones, 9 Hundredths
7.09

11. 5 + 0.5 + 0.01
5.51

12. nine and forty-three Hundredths
9.43

Lesson 4: Decimals in Multiple Forms | 77

TEACHER NOTE: These are challenging problems that will require students to think about how many Hundredths are in a Tenth and how many Tenths are in one whole. Where there may be discrepancies in answers (such as saying 10 Tenths instead of 1 Hundredth), remind students about critical place value concepts, such as regrouping. The conversations around equivalency are an opportunity for students to practice and solidify their understanding of place value. This is an introduction to the topic and a way to build on their prior knowledge.

Answer Key for Naming Decimals:

1. four and fifty-three hundredths
2. forty-eight hundredths
3. two and thirteen-hundredths
4. 4 Ones, 5 Tenths, 2 Hundredths
5. 7 Ones, 3 Tenths, 4 Hundredths
6. 6 Tenths, 9 Hundredths
7. 2 + 0.04
8. 2 + 0.50
9. 5 + 0.6 + 0.08
10. 7.09
11. 5.51
12. 9.43
13. Standard form: 1.03
    Word form: one and three-hundredths (Students may forget that they should regroup the 10 Tenths into one whole.)
    Unit form: 1 One, 3 Hundredths (Students may say 10 Tenths and 3 Hundredths.)
    Expanded form: 1 + 0.03
14. Standard form: 4.1
    Word form: four and one-tenth
    Unit form: 4 Ones, 1 Tenth
    Expanded form: 4 + 0.1
15. Standard form: 4.58
    Word form: four and fifty-eight hundredths
    Unit form: 4 Ones, 5 Tenths, 8 Hundredths
    Expanded form: 4 + 0.5 + 0.08

CONNECT (7 min)

Writing About Math

Ask students to turn to Lesson 4 CONNECT Writing About Math and respond to the prompt.

Answer Key for Writing About Math:
Students' responses will vary. If needed, use an example such as 0.2 to reinforce that the 0 before the decimal point is not necessary and it could be written as .2 but we are using it to help us remember that the number is a decimal number and there are no Ones. However, for an example such as 0.03, the 0 before the decimal point is not necessary, but the 0 before the 3 is very important. Otherwise, the number would be 0.3 and three-tenths is very different than three-hundredths.

WRAP-UP (3 min)

Let's Chat About Our Learning

Ask students to share their thinking about the importance of zeroes. Encourage students to ask questions to clear up confusion and misconceptions.

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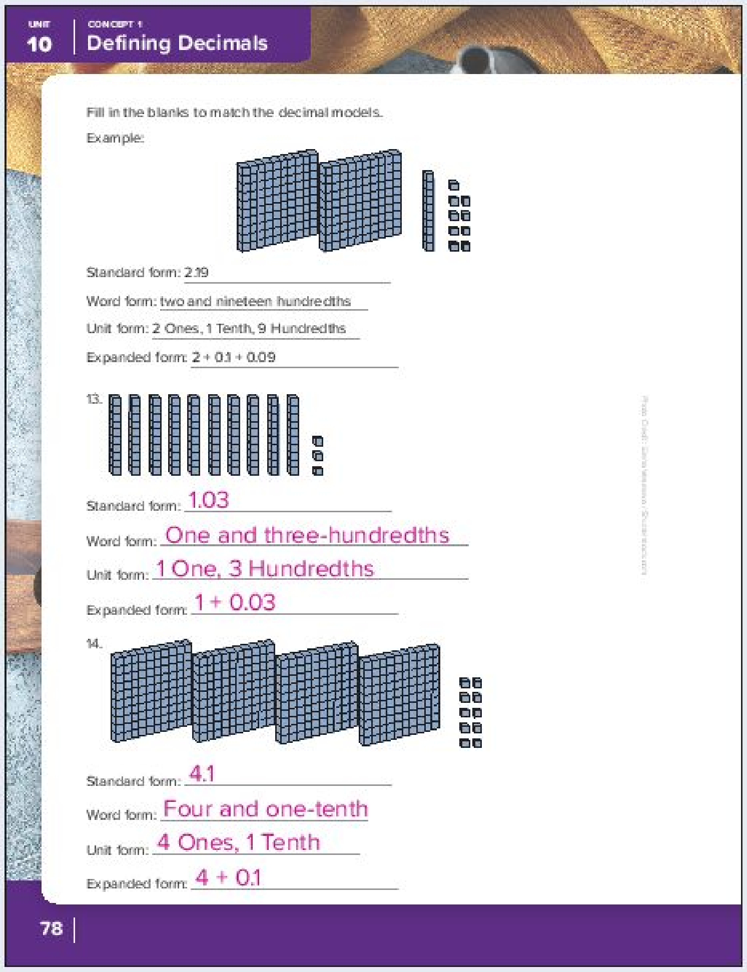

UNIT 10 | CONCEPT 1
Defining Decimals

Fill in the blanks to match the decimal models.

Example:

Standard form: 2.19
Word form: two and nineteen hundredths
Unit form: 2 Ones, 1 Tenth, 9 Hundredths
Expanded form: 2 + 0.1 + 0.09

13.

Standard form: 1.03
Word form: One and three-hundredths
Unit form: 1 One, 3 Hundredths
Expanded form: 1 + 0.03

14.

Standard form: 4.1
Word form: Four and one-tenth
Unit form: 4 Ones, 1 Tenth
Expanded form: 4 + 0.1

78

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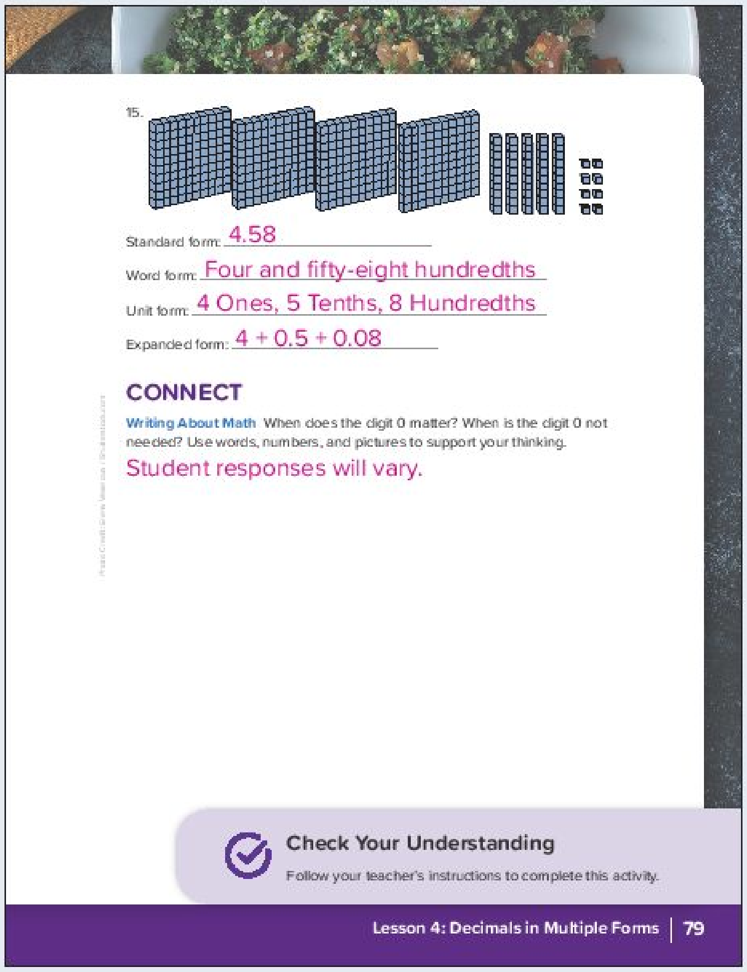
Student Page 79



15.

Standard form: 4.58

Word form: Four and fifty-eight hundredths

Unit form: 4 Ones, 5 Tenths, 8 Hundredths

Expanded form: 4 + 0.5 + 0.08

CONNECT

Writing About Math When does the digit 0 matter? When is the digit 0 not needed? Use words, numbers, and pictures to support your thinking.

Student responses will vary.

Check Your Understanding

Follow your teacher's instructions to complete this activity.

Lesson 4: Decimals in Multiple Forms | 79

PRACTICE

Direct students to Lesson 4 PRACTICE and have them complete the problems. Address student errors and misconceptions.

Check Your Understanding

Standard Form	Word Form	Unit Form	Expanded Form
4.02	four and two-hundredths	4 Ones, 2 Hundredths	4 + 0.02
6.98	six and ninety-eight hundredths	6 Ones, 9 Tenths, 8 Hundredths	6 + 0.9 + 0.08
8.17	eight and seventeen-hundredths	8 Ones, 1 Tenth, 7 Hundredths	8 + 0.1 + 0.07
2.57	two and fifty-seven hundredths	2 Ones, 5 Tenths, 7 Hundredths	2 + 0.5 + 0.07
8.01	eight and one-hundredth	8 Ones, 1 Hundredth	8 + 0.01
7.06	seven and six hundredths	7 Ones, 6 Hundredths	7 + 0.06
8.69	eight and sixty-nine hundredths	8 Ones, 6 Tenths, 9 Hundredths	8 + 0.6 + 0.09
2.09	two and nine-hundredths	2 Ones, 9 Hundredths	2 + 0.09

Concept Check-In and Remediation

Lesson Overview

In this lesson, students work to correct misconceptions and errors from Concept 1: Defining Decimals. First, administer the Concept Check-In. Once you have reviewed the quiz results, choose remediation activities based on the needs of your students. Some recommendations are listed in the chart, but the needs of your particular students should inform your choices. Students may work independently, in pairs, or in a small group with the teacher.

Concept Essential Question

- How are decimals, fractions, and whole numbers similar and different?

Learning Objective

In this lesson

- Students will work to correct misconceptions and errors related to identifying, reading, and writing decimals.

Grade-Level Standards

4.A.3.a Read and write decimals to Hundredths using numerals, word form, and expanded form.

4.A.3.b Use models to illustrate and compare decimals to Hundredths.

Vocabulary Check-In

Review concept vocabulary as needed.

Materials List

- Materials may vary

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DIGITAL

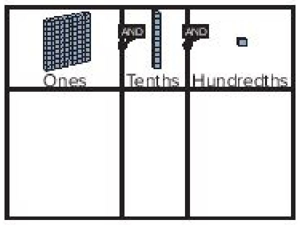
Concept Check-In and Remediation

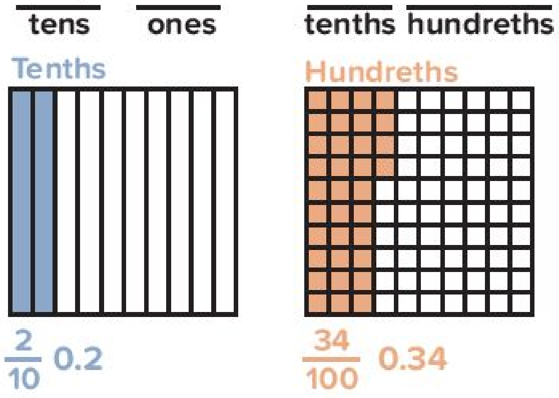
Quick Code:
egmt4144

COMMON MISCONCEPTIONS AND ERRORS

- Students may not understand that a decimal, like a fraction, is a number between two whole numbers.
- Students tend to convert unit fractions (i.e., fractions of the form $\frac{1}{n}$) to decimals using the denominator as reference such as $\frac{1}{5} = 0.5$.
- Students may struggle to understand how to move between fractions and decimals using the numerator to represent the whole and the denominator as the Tenths or Hundredths $\frac{1}{4} = 1.4$
- Students may struggle to understand that the values of digits decrease as you move to the right of the decimal point because the word form appears to increase. For example, 2 Tenths is larger than 2 Hundredths.

Remediation: Correcting Misconceptions

If… Students do not understand that a decimal, like a fraction, is a number between two whole numbers.	**Then…** Review Lessons 1 and 2. Practice identifying decimals between 0 and 1 and well as decimals over 1 with visual models. Additionally, have students build and write decimals using place value pieces if available and a decimal mat similar to the one shown. 
If… Students convert unit fractions to decimals using the denominator as reference (for example, $\frac{1}{5} = 0.5$). Students struggle to understand how to move between fractions and decimals using the numerator to represent the whole and the denominator as the Tenths or Hundredths (for example, writing $\frac{1}{4}$ as 1.4).	**Then…** Review Lessons 1 and 2. Review the definition of a decimal fraction and stress that decimals are part of our decimal number system and are therefore in powers of 10, 100, etc. Moving between decimals and fractions in this first concept relies primarily on students just understanding that 0.1 is said as "one-tenth" and represents $\frac{1}{10}$ of a whole. They are not converting fractions that are not in decimal fraction form, but it is important to help students see and practice that decimal fractions have denominators that relate to the place value system's powers of 10.

If...	**Then...**
Students struggle to understand that the values of digits decrease as you move to the right of the decimal point because the word form appears to increase. For example, 2 Tenths is larger than 2 Hundredths.	Review Lesson 3 BUILD. Introduce a place value model chart (see example) and have students practice writing decimals and sketching their value models. This will help students see that Tenths are greater than Hundredths. Example:  tens ones tenths hundreths Tenths Hundreths $\frac{2}{10}$ 0.2 $\frac{34}{100}$ 0.34

CONCEPT

2

Decimals and Fractions

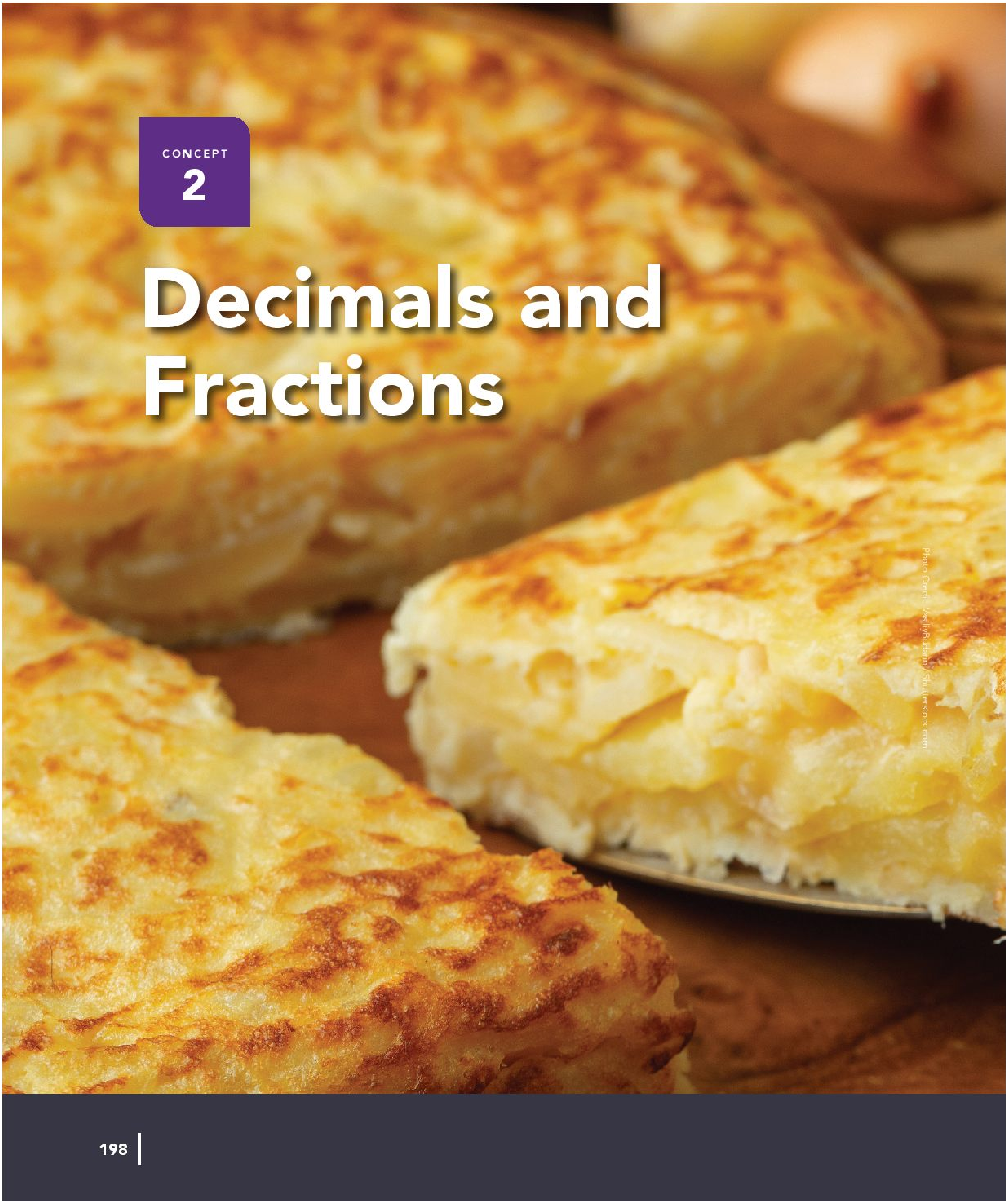
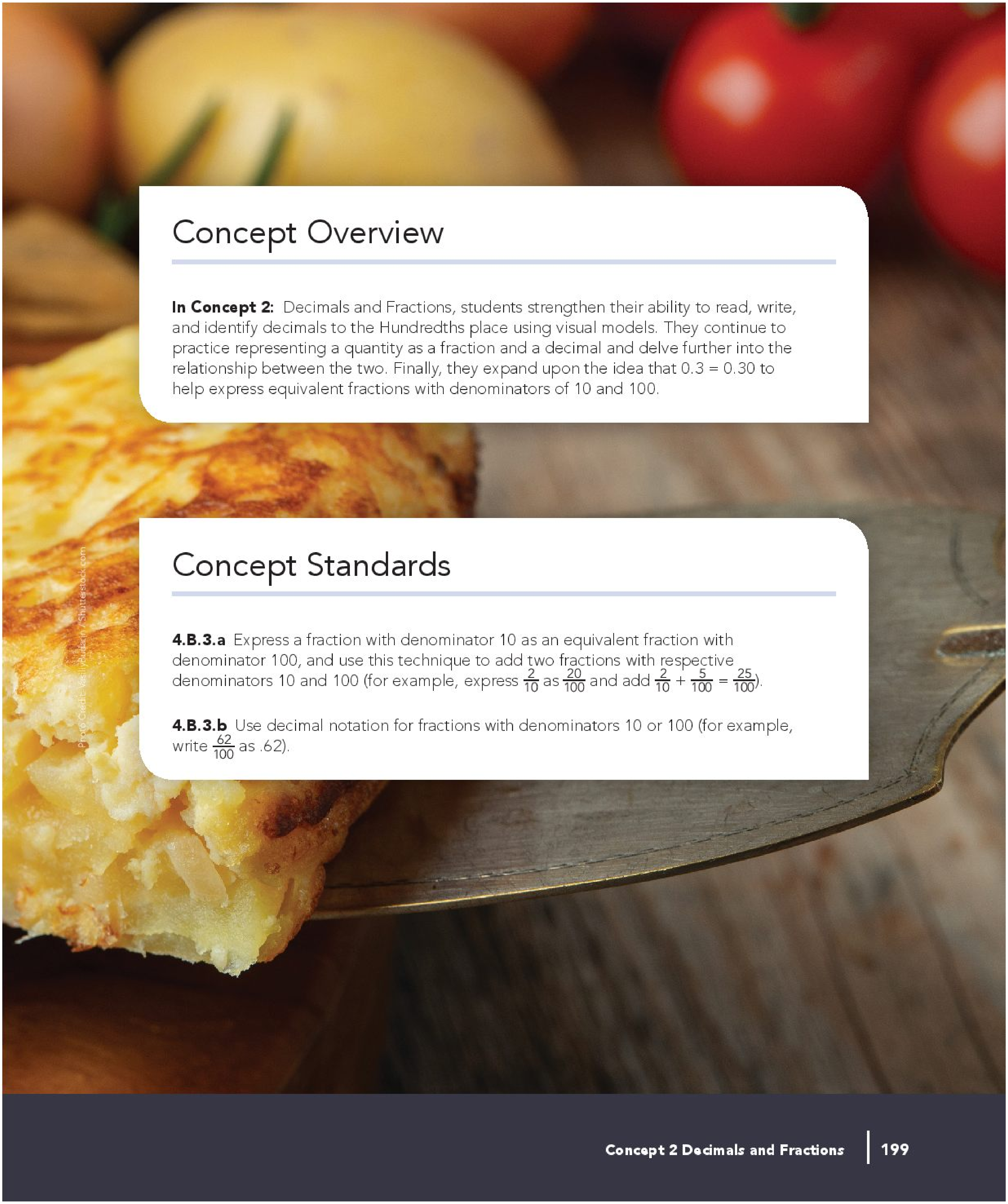


Photo Credit: VasiliyBudarin/Shutterstock.com



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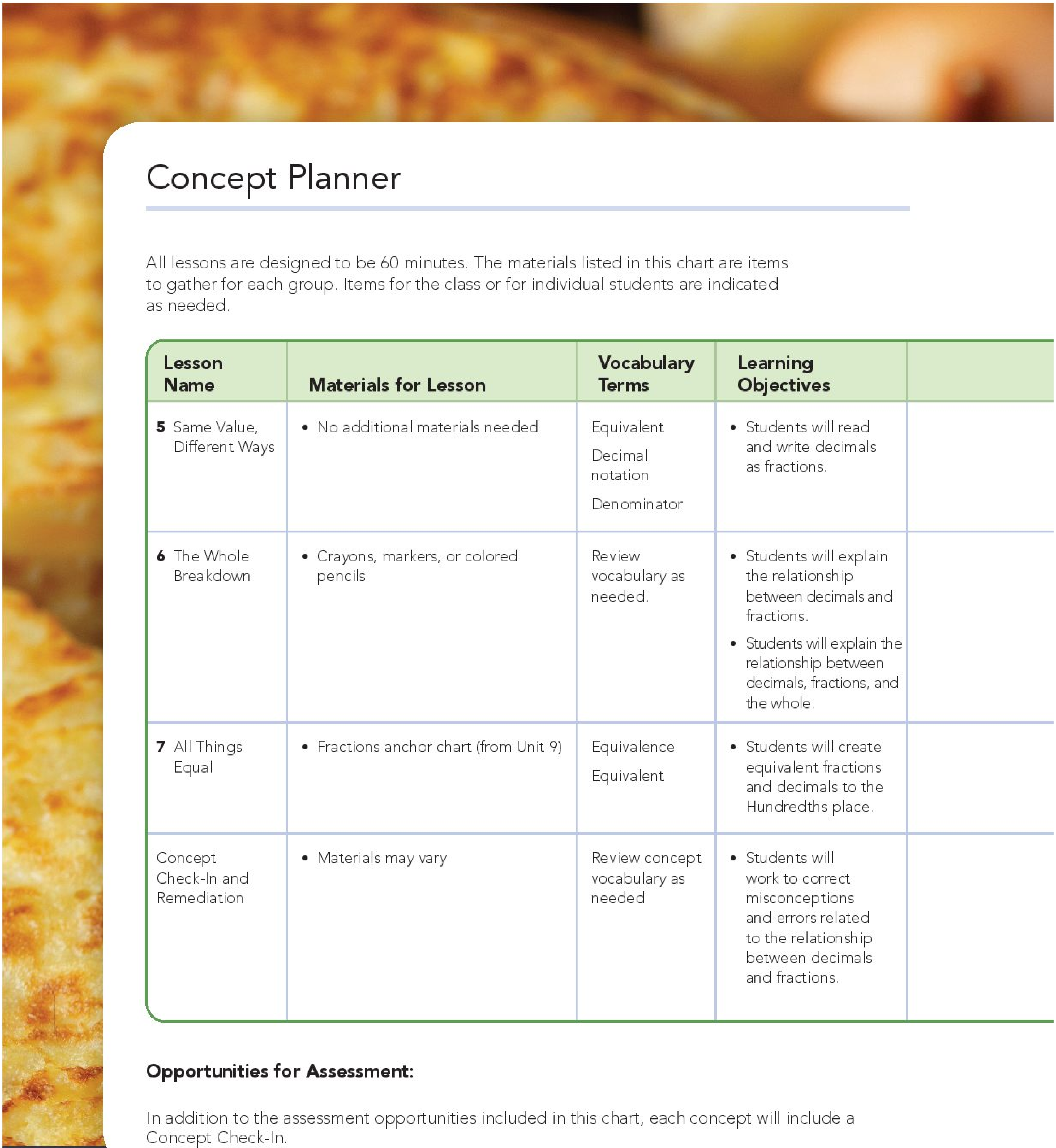
Concept Overview

In Concept 2: Decimals and Fractions, students strengthen their ability to read, write, and identify decimals to the Hundredths place using visual models. They continue to practice representing a quantity as a fraction and a decimal and delve further into the relationship between the two. Finally, they expand upon the idea that 0.3 = 0.30 to help express equivalent fractions with denominators of 10 and 100.

Concept Standards

4.B.3.a Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100 (for example, express $\frac{2}{10}$ as $\frac{20}{100}$ and add $\frac{2}{10} + \frac{5}{100} = \frac{25}{100}$).

4.B.3.b Use decimal notation for fractions with denominators 10 or 100 (for example, write $\frac{62}{100}$ as .62).



Concept Planner

All lessons are designed to be 60 minutes. The materials listed in this chart are items to gather for each group. Items for the class or for individual students are indicated as needed.

Lesson Name	**Materials for Lesson**	**Vocabulary Terms**	**Learning Objectives**	
5 Same Value, Different Ways	- No additional materials needed	Equivalent Decimal notation Denominator	- Students will read and write decimals as fractions.	
6 The Whole Breakdown	- Crayons, markers, or colored pencils	Review vocabulary as needed.	- Students will explain the relationship between decimals and fractions. - Students will explain the relationship between decimals, fractions, and the whole.	
7 All Things Equal	- Fractions anchor chart (from Unit 9)	Equivalence Equivalent	- Students will create equivalent fractions and decimals to the Hundredths place.	
Concept Check-In and Remediation	- Materials may vary	Review concept vocabulary as needed	- Students will work to correct misconceptions and errors related to the relationship between decimals and fractions.	

Opportunities for Assessment:

In addition to the assessment opportunities included in this chart, each concept will include a Concept Check-In.

	Common Misconceptions and Errors	Opportunities for Formative Assessment
	• Students may struggle to write a decimal as a fraction.	Name the Model, A Model Fraction, Are They Equivalent?, Practice, Check Your Understanding
	• Students may struggle to understand how many Tenths or Hundredths are in whole numbers.	Wholes to Fractions, The Whole Deal, Writing About Math, Practice, Check Your Understanding
	• Students may confuse Tenths and Hundredths believing that 0.4 is not equal to 0.40 because 40 > 4. • Students may increase the denominator but not the numerator to find an equivalent fraction (for example, $\frac{3}{10} = \frac{3}{100}$).	Equivalency Review, Is it the Same?, Create the Same, Writing About Math, Practice, Check Your Understanding
	• Students may struggle to write a decimal as a fraction. • Students may struggle to understand how many Tenths or Hundredths are in whole numbers. • Students may confuse Tenths and Hundredths believing that 0.4 is not equal to 0.40 because 40 > 4. • Students may increase the denominator but not the numerator to find an equivalent fraction (for example, $\frac{3}{10} = \frac{3}{100}$).	

LESSON 5
Same Value, Different Ways

Lesson Overview

In this lesson, students put together the concepts they learned in Concept 1 as they strengthen their understanding of decimals and practice reading and writing decimals as fractions. Students create models and fractions to represent whole numbers and fractions and are introduced to the idea of converting Tenths to Hundredths. This concept is further explored in Lesson 8.

Essential Question

- What strategies can I use to find equivalent fractions and decimals?

Learning Objective

In this lesson

- Students will read and write decimals as fractions.

Grade-Level Standard

4.B.3.b Use decimal notation for fractions with denominators 10 or 100 (for example, write $\frac{62}{100}$ as .62).

Vocabulary Check-In

equivalent, decimal notation, denominator

Materials List

- No additional materials needed

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Lesson 5
Same Value, Different Ways

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egmt4145

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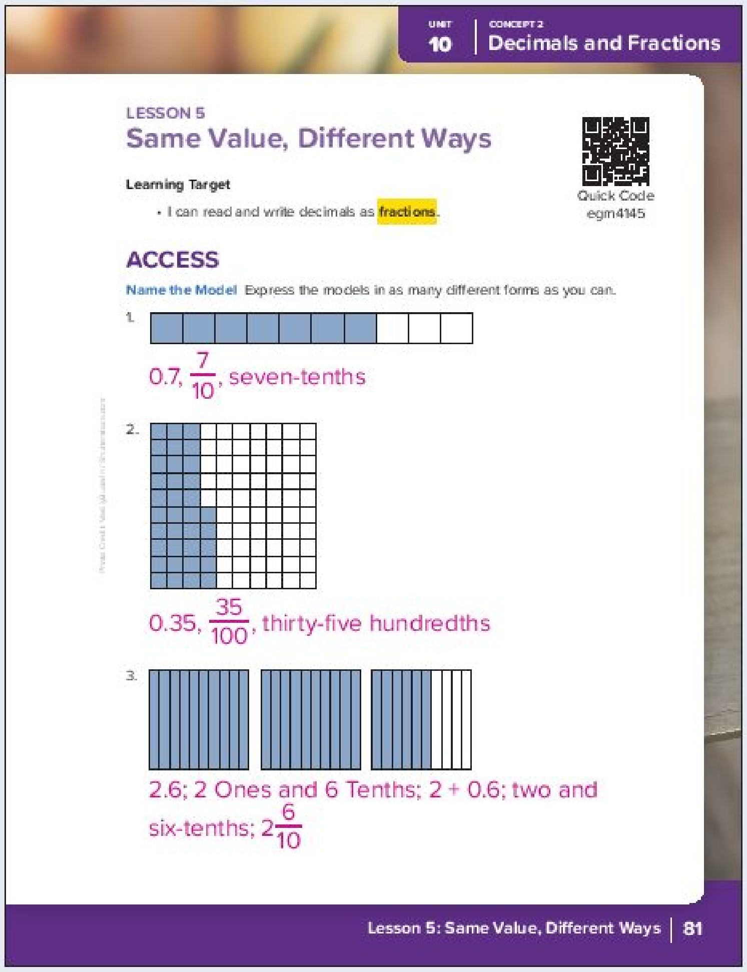

UNIT 10 | CONCEPT 2 Decimals and Fractions

LESSON 5

Same Value, Different Ways

Learning Target

- I can read and write decimals as fractions.

Quick Code
egm4145

ACCESS

Name the Model Express the models in as many different forms as you can.

1. 0.7, $\frac{7}{10}$, seven-tenths

2. 0.35, $\frac{35}{100}$, thirty-five hundredths

3. 2.6; 2 Ones and 6 Tenths; 2 + 0.6; two and six-tenths; $2\frac{6}{10}$

Lesson 5: Same Value, Different Ways | 81

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may struggle to write a decimal as a fraction.

Name the Model

1. Ask students to turn to Lesson 5 ACCESS Name the Model and chorally read the Learning Target. Ask students to use a Fist-to-Five to evaluate their current level of confidence in their ability to meet the Learning Target.
2. Ask students to complete Problems 1–3.
3. Review the answers as a class. Explain to students that today they will focus on reading and writing decimals as fractions. If students did not express the models as a fraction, ask them to take a moment now and try.
4. Call on students to share their thinking about how to write the fractions. Remind students that all fractional parts are less than a whole but they can be combined with wholes to make mixed fractions.
5. Ask students to talk to their Shoulder Partner about whether they think that all fractions can be written as decimals or only decimal fractions that are Tenths or Hundredths.
6. Call on partners to share their thinking with the class. Reinforce that all fractions can be written as a decimal since they both represent a number less than a whole. Tell students they will get to explore this more later, but today, they will convert between Tenths and Hundredths in fractions and decimals.

Answer Key for Name the Model:

1. 0.7; seven-tenths; 7 Tenths; $\frac{7}{10}$
2. 0.35; 3 Tenths, 5 Hundredths; thirty-five hundredths; 0.3 + 0.05; $\frac{35}{100}$
3. 2.6; 2 Ones and 6 Tenths; 2 + 0.6; two and six-tenths; $2\frac{6}{10}$

BUILD (40 min)

A Model Fraction, Decimals as Fractions, Modeling Decimals, and More Decimals as Fractions

1. Ask students to turn to Lesson 5 BUILD A Model Fraction. Work with students to complete Problem 1. Answer any questions students have about the problem, and then have students complete Problems 2–4.
2. After a few minutes, review the answers with students. Ask the following questions and allow students to think for a moment, and then share their ideas:

ASK

- *How do you know whether to use 10 or 100 as the denominator? If there is one digit after the decimal point, it is Tenths. If there are two digits after the decimal point, it is Hundredths.*
- *Could you show 0.9 (Problem 1) if the model were divided into 100 small squares instead? Yes, color in 90 small squares.*
- *Could you show 0.38 (Problem 2) if the model were divided into 10 columns instead? No, you would have to divide it further into Hundredths.*

3. Repeat the process for each section, solving the first problem and having students finish the next three. Ask students to say their answers aloud to practice reading fractions and decimals. Reinforce for the remaining sections that, just like mixed numbers (a whole number and a fraction), these decimal numbers have at least one whole and part of a whole.

TEACHER NOTE: The whole numbers in some of the models are represented with 100s models. This is so students can see that they can be broken apart into Hundredths. However, they could have been represented by Tenths as well.

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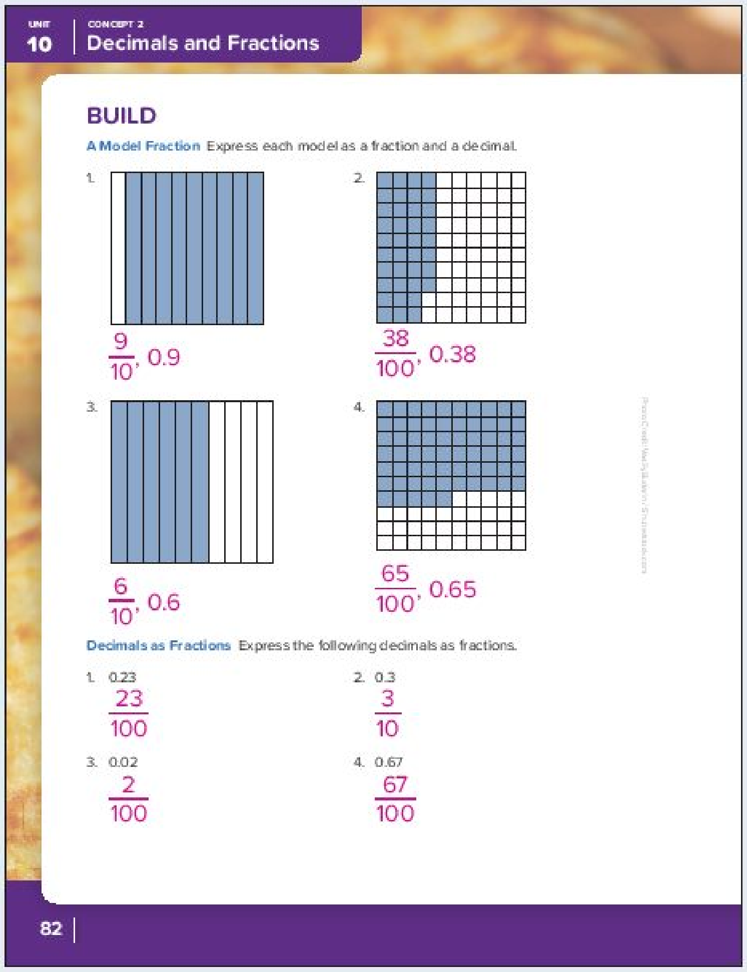
Student Page 82


UNIT 10 | CONCEPT 2
Decimals and Fractions

BUILD

A Model Fraction Express each model as a fraction and a decimal.

1. $\frac{9}{10}$, 0.9
2. $\frac{38}{100}$, 0.38
3. $\frac{6}{10}$, 0.6
4. $\frac{65}{100}$, 0.65

Decimals as Fractions Express the following decimals as fractions.

1. 0.23 $\frac{23}{100}$
2. 0.3 $\frac{3}{10}$
3. 0.02 $\frac{2}{100}$
4. 0.67 $\frac{67}{100}$

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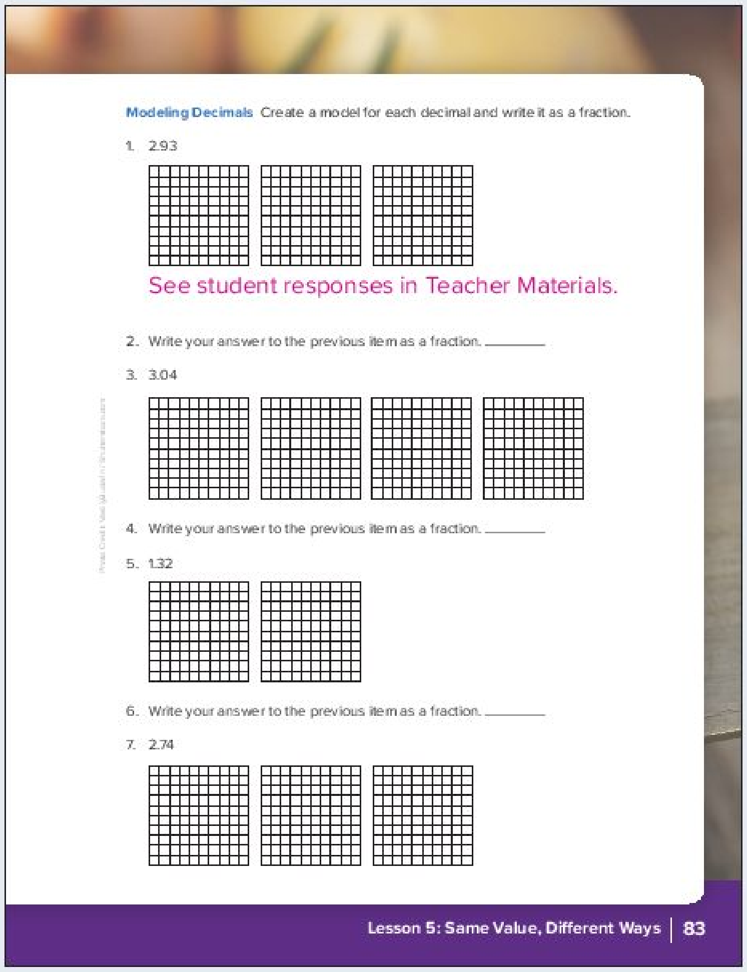
Student Page 83



Modeling Decimals Create a model for each decimal and write it as a fraction.

1. 2.93

See student responses in Teacher Materials.

2. Write your answer to the previous item as a fraction. ________
3. 3.04
4. Write your answer to the previous item as a fraction. ________
5. 1.32
6. Write your answer to the previous item as a fraction. ________
7. 2.74

Lesson 5: Same Value, Different Ways | 83

Answer Key for A Model Fraction:

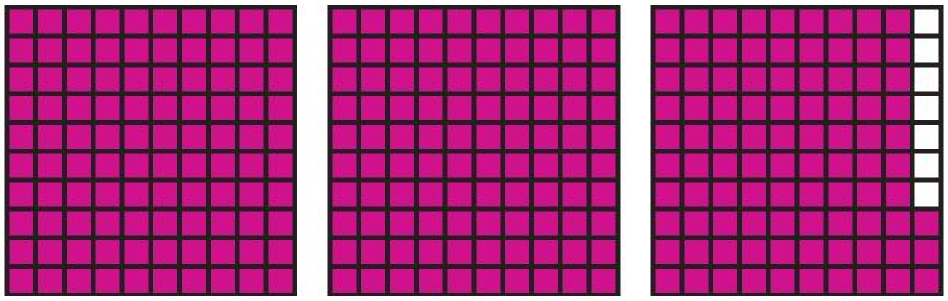
1. 0.9 and $\frac{9}{10}$
2. 0.38 and $\frac{38}{100}$
3. 0.6 and $\frac{6}{10}$
4. 0.65 and $\frac{65}{100}$

Answer Key for Decimals as Fractions:

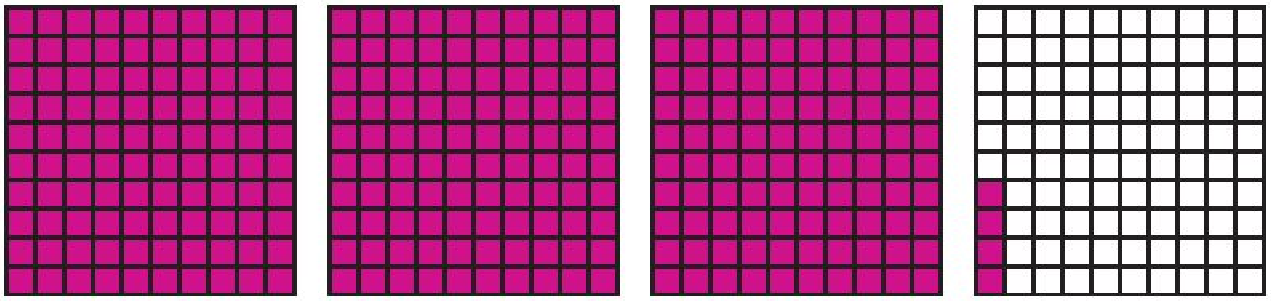
1. $\frac{23}{100}$
2. $\frac{3}{10}$
3. $\frac{2}{100}$
4. $\frac{67}{100}$

Answer Key for Modeling Decimals:

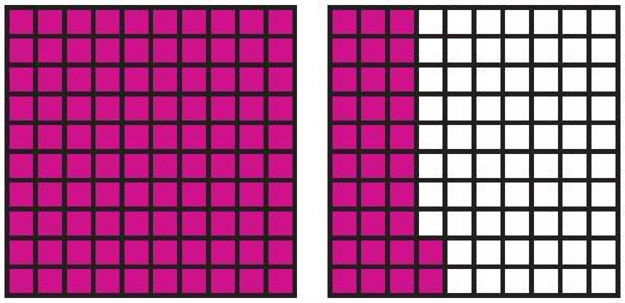
1. 2.93



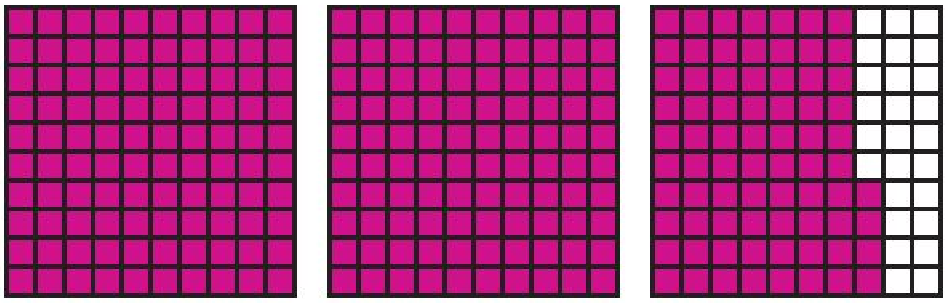
2. $2\frac{93}{100}$
3. 3.04



4. $3\frac{4}{100}$
5. 1.32



6. $1\frac{32}{100}$
7. 2.74



8. $2\frac{74}{100}$

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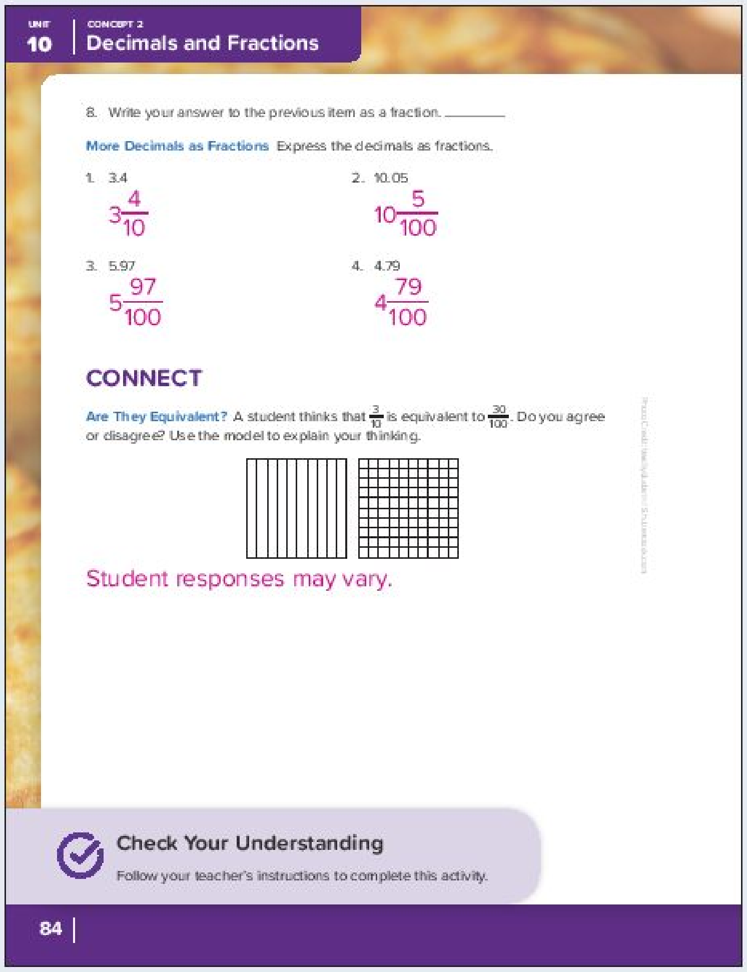
Student Page 84



UNIT 10 | CONCEPT 2 Decimals and Fractions

8. Write your answer to the previous item as a fraction. ________

More Decimals as Fractions Express the decimals as fractions.

1. 3.4 $3\frac{4}{10}$
2. 10.05 $10\frac{5}{100}$
3. 5.97 $5\frac{97}{100}$
4. 4.79 $4\frac{79}{100}$

CONNECT

Are They Equivalent? A student thinks that $\frac{3}{10}$ is equivalent to $\frac{30}{100}$. Do you agree or disagree? Use the model to explain your thinking.

Student responses may vary.

Check Your Understanding

Follow your teacher's instructions to complete this activity.

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CONNECT (7 min)

Are They Equivalent?

Ask students to turn to Lesson 5 CONNECT Are they Equivalent? and answer the question.

Answer Key for Are They Equivalent?:

Students should see that just like when using a fraction model, the whole is the same, but it is divided into Tenths in one model and Hundredths in the other. Since the size is the same and both are divided into even parts, the fractions are equivalent. This will be addressed further in later lessons.

WRAP-UP (3 min)

Let's Chat About Our Learning

Ask students to share their response to the Are They Equivalent? prompt. Encourage students to ask each other questions and to model their thinking on the board.

PRACTICE

Direct students to Lesson 5 PRACTICE and have them complete the problems. Address student errors and misconceptions related to reading and writing decimals as fractions.

Check Your Understanding

Express each model as a decimal and fraction.

1. 4.1; $4\frac{1}{10}$
2. 5.38; $5\frac{38}{100}$
3. 4.90; $4\frac{90}{100}$ or $4\frac{9}{10}$
4. There were 100 people at the market. 43 of them bought flour. Express this as a decimal and fraction.

   0.43; $\frac{43}{100}$
5. Express this number as a decimal and fraction: 7 Tens, 2 Ones, 4 Tenths, 5 Hundredths

   72.45; $72\frac{45}{100}$

Materials List

- Crayons, markers, or colored pencils

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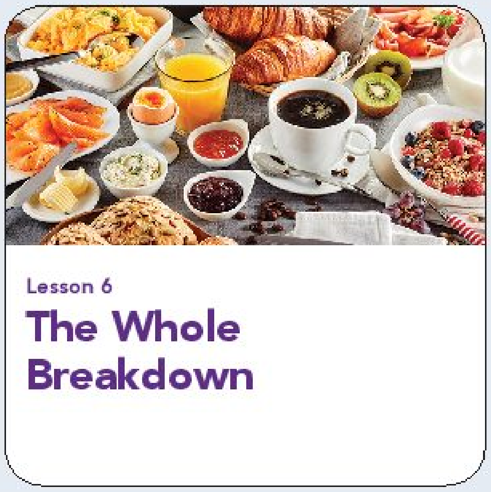
DIGITAL



Lesson 6

The Whole Breakdown

Quick Code:
egmt4146

LESSON 6
The Whole Breakdown

Lesson Overview

In this lesson, students practice converting between whole numbers, decimals, and fractions. They further explore the composition of whole numbers by determining how many Tenths and Hundredths are in whole numbers and whole numbers with decimals.

Essential Question

- What strategies and understandings do you use to find equivalent fractions and decimals?

Learning Objectives

In this lesson

- Students will explain the relationship between decimals and fractions.
- Students will explain the relationship between decimals, fractions, and the whole.

Grade-Level Standard

4.B.3.b Use decimal notation for fractions with denominators 10 or 100 (for example, write $\frac{62}{100}$ as .62).

Vocabulary Check-In

Review vocabulary as needed.

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may struggle to understand how many Tenths or Hundredths are in whole numbers.

Wholes to Fractions

1. Direct students to Lesson 6 ACCESS Wholes to Fractions and ask them to complete the problems. After a few minutes, discuss the answers with the class.
2. Ask students to think about how they would write a fraction if the square was divided into 1,000 equal pieces. $\frac{1,000}{1,000}$

TEACHER NOTE: Decimals to Thousandths is a Primary 5 standard, but students should be exposed to the pattern.

Answer Key for Wholes to Fractions:
Students should see that the models both represent 1 whole. The first model is divided into Hundredths and would be expressed as $\frac{100}{100}$. The second model is divided into Tenths and would be expressed as $\frac{10}{10}$. The fractions are equivalent.

BUILD (40 min)

The Whole Deal

1. Direct students to Lesson 6 BUILD The Whole Deal.
2. Tell students that today they will look at different ways to write fraction and decimals equivalents.

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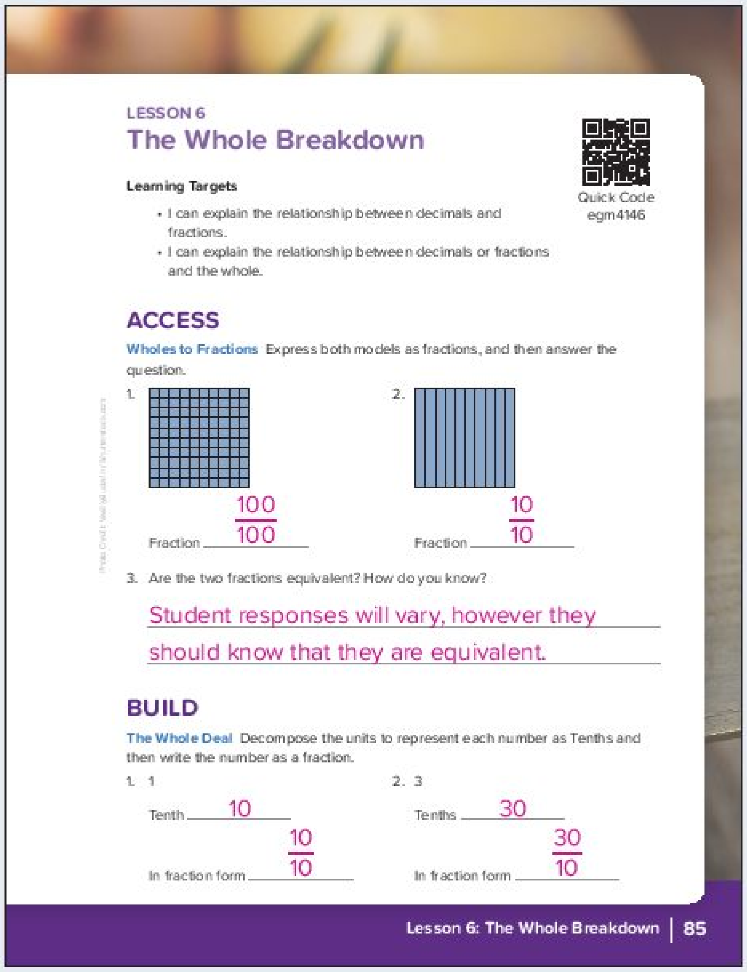
Student Page 85



LESSON 6

The Whole Breakdown

Quick Code
egm4146

Learning Targets

- I can explain the relationship between decimals and fractions.
- I can explain the relationship between decimals or fractions and the whole.

ACCESS

Wholes to Fractions Express both models as fractions, and then answer the question.

1. Fraction $\frac{100}{100}$

2. Fraction $\frac{10}{10}$

3. Are the two fractions equivalent? How do you know?

Student responses will vary, however they should know that they are equivalent.

BUILD

The Whole Deal Decompose the units to represent each number as Tenths and then write the number as a fraction.

1. 1
Tenth 10
In fraction form $\frac{10}{10}$

2. 3
Tenths 30
In fraction form $\frac{30}{10}$

Lesson 6: The Whole Breakdown | 85

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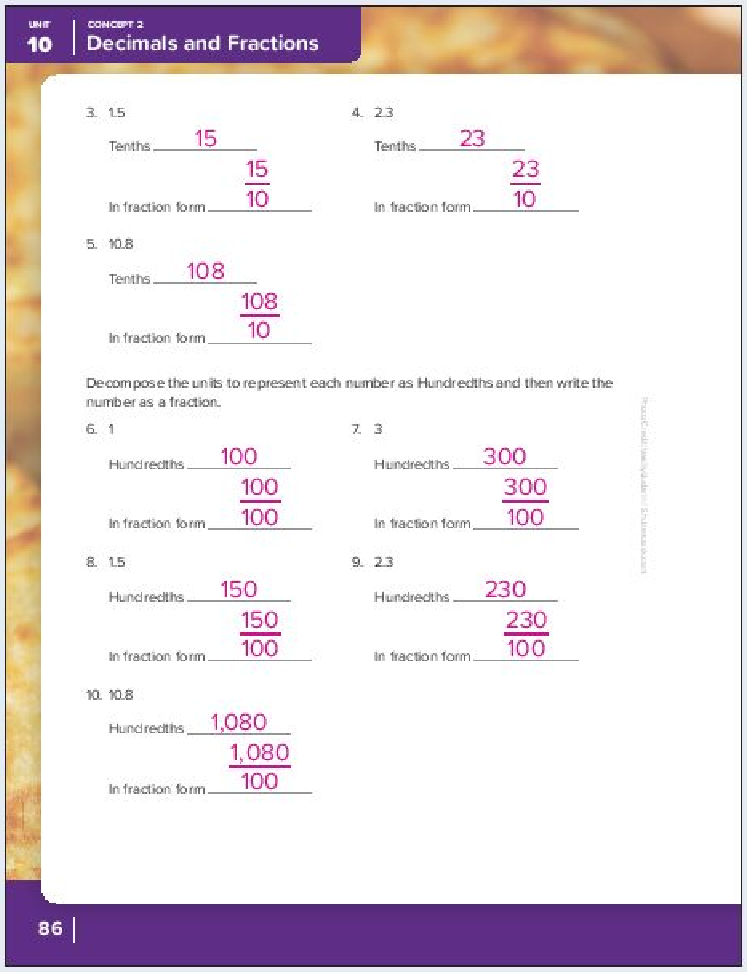
Student Page 86



UNIT 10 | CONCEPT 2
Decimals and Fractions

3. 1.5

Tenths 15

In fraction form $\frac{15}{10}$

4. 2.3

Tenths 23

In fraction form $\frac{23}{10}$

5. 10.8

Tenths 108

In fraction form $\frac{108}{10}$

Decompose the units to represent each number as Hundredths and then write the number as a fraction.

6. 1

Hundredths 100

In fraction form $\frac{100}{100}$

7. 3

Hundredths 300

In fraction form $\frac{300}{100}$

8. 1.5

Hundredths 150

In fraction form $\frac{150}{100}$

9. 2.3

Hundredths 230

In fraction form $\frac{230}{100}$

10. 10.8

Hundredths 1,080

In fraction form $\frac{1,080}{100}$

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3. Ask students to think about the problem from ACCESS then pose the following questions:

ASK

- *How many Tenths are in 1 whole?* 10
- *How many Hundredths are in 1 whole?* 100
- *How many Tenths are in 2?* 20
- *How many Hundredths are in 2?* 200

4. Ask students to work with a partner to solve Problems 1–5. After a few minutes, go over the answers together. Discuss any problems students found challenging. Use visual models to help students build understanding. Whenever possible, ask students to demonstrate their problem-solving strategies and share their reasoning.

5. Repeat the process for Problems 6–10.

TEACHER NOTE: Students may see the pattern of adding one zero to the number to create Tenths and two zeroes to the number to create Hundredths. However, we want students to understand that the zero represents adding a group of 10 or a group of 100. This will be further discussed in Lesson 8 when students explore Tenths and Hundredths as equivalent fractions.

Answer Key for The Whole Deal:

1. 1 = 10 Tenths; $\frac{10}{10}$
2. 3 = 30 Tenths; $\frac{30}{10}$
3. 1.5 = 15 Tenths; $\frac{15}{10}$
4. 2.3 = 23 Tenths; $\frac{23}{10}$
5. 10.8 = 108 Tenths; $\frac{108}{10}$
6. 1 = 100 Hundredths; $\frac{100}{100}$
7. 3 = 300 Hundredths; $\frac{300}{100}$
8. 1.5 = 150 Hundredths; $\frac{150}{100}$
9. 2.3 = 230 Hundredths; $\frac{230}{100}$
10. 10.8 = 1,080 Hundredths; $\frac{1,080}{100}$

CONNECT (7 min)

Writing About Math

Ask students to turn to Lesson 6 CONNECT Writing About Math to respond to the prompt.
Answers will vary.

WRAP-UP (3 min)

Let's Chat About Our Learning

Ask volunteers to share their Writing About Math responses. Take note of areas students identify as challenging.

PRACTICE

Direct students to Lesson 6 PRACTICE and have them complete the problems. Address student errors and misconceptions related to the relationships among decimals, fractions, and the whole.

Check Your Understanding

Rewrite the numbers in decimal form.

1. $6\frac{4}{10}$ 6.40
2. $7\frac{3}{10}$ 7.3
3. $2\frac{1}{10}$ 2.1
4. Adam has $1\frac{4}{10}$ liters of water. Express this volume as a decimal. 1.4 L
5. Decompose the units and represent $1\frac{4}{10}$ as Tenths. 14 Tenths

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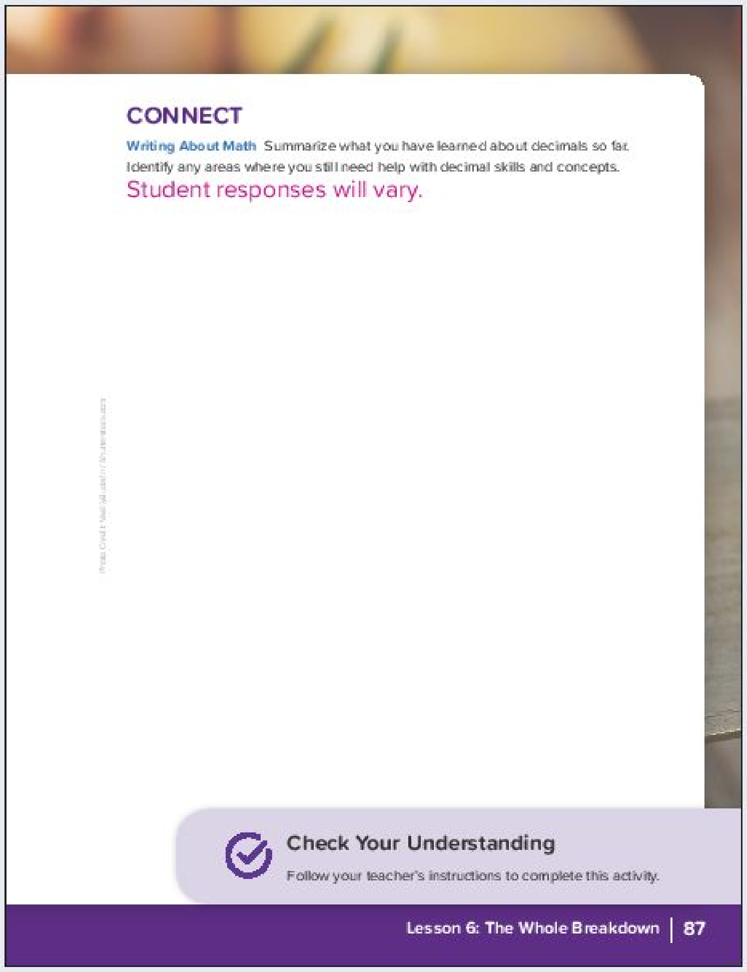
Student Page 87



CONNECT

Writing About Math Summarize what you have learned about decimals so far. Identify any areas where you still need help with decimal skills and concepts.
Student responses will vary.

Check Your Understanding
Follow your teacher's instructions to complete this activity.

Lesson 6: The Whole Breakdown | 87

Materials List

- Fraction anchor chart (from Unit 9)

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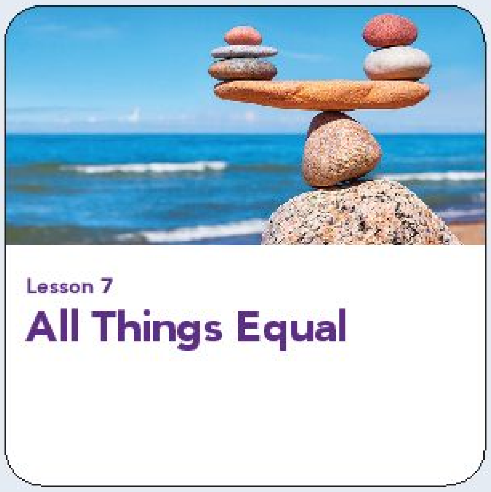
DIGITAL


Lesson 7

All Things Equal

Quick Code:
egmt4147

LESSON 7
All Things Equal

Lesson Overview

In this lesson, students review equivalent fractions and use models to create equivalent decimal fractions. They then create equivalent fractions and decimals without models and explore the patterns that emerge when converting between Tenths and Hundredths.

Essential Question

- What strategies can I use to find equivalent fractions and decimals?

Learning Objective

In this lesson

- Students will create equivalent fractions and decimals to the Hundredths place.

Grade-Level Standards

4.B.3.a Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100 (for example, express $\frac{2}{10}$ as $\frac{20}{100}$ and add $\frac{2}{10} + \frac{5}{100} = \frac{25}{100}$).

4.B.3.b Use decimal notation for fractions with denominators 10 or 100 (for example, write $\frac{62}{100}$ as .62).

Vocabulary Check-In

equivalence

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may confuse Tenths and Hundredths believing that 0.4 is not equal to 0.40 because 40 > 4.
- Students may increase the denominator but not the numerator to find an equivalent fraction (for example, $\frac{3}{10} = \frac{3}{100}$).

Equivalency Review

1. Direct students to Lesson 7 ACCESS Equivalency Review to chorally read the Learning Targets. Review the meaning of equivalency and equivalent, as needed. Ask students to share what they recall about equivalent fractions. Remind students of the work they did in Unit 9 finding equivalent fractions. Make sure students understand that, if the numerator and the denominator both increase by the same factor, the two fractions are equivalent. Reference the Fraction anchor chart, if necessary.
2. Read the directions to students and ask them to work independently to complete the learning activity, and then discuss their answers with their Shoulder Partner.
3. After students are finished, go over the answers together. Discuss any lingering misconceptions or common errors. Explain to students that today they will use their understanding of equivalent fractions and apply it to Tenths and Hundredths.

Answer Key for Equivalency Review:

Students should circle the following fractions:

[✓ 1. $\frac{1}{2} = \frac{3}{6}$] 2. $\frac{2}{3} = \frac{2}{6}$ 3. $\frac{8}{10} = \frac{4}{10}$

[✓ 4. $\frac{8}{12} = \frac{4}{6}$] [✓ 5. $\frac{2}{3} = \frac{6}{9}$] 6. $\frac{4}{8} = \frac{0}{4}$

7. $\frac{1}{4} = \frac{5}{8}$ [✓ 8. $\frac{2}{10} = \frac{4}{20}$] [✓ 9. $\frac{5}{10} = \frac{1}{2}$]

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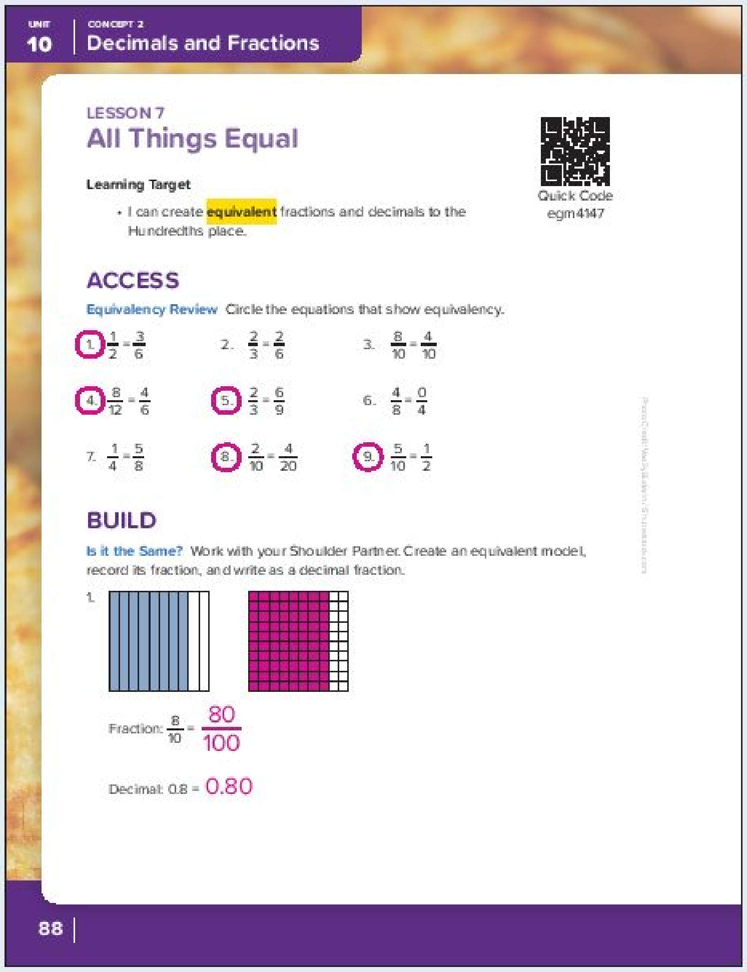

UNIT 10 | CONCEPT 2 Decimals and Fractions

LESSON 7

All Things Equal

Learning Target

- I can create **equivalent** fractions and decimals to the Hundredths place.

Quick Code egm4147

ACCESS

Equivalency Review Circle the equations that show equivalency.

[✓ 1. $\frac{1}{2} = \frac{3}{6}$] 2. $\frac{2}{3} = \frac{2}{6}$ 3. $\frac{8}{10} = \frac{4}{10}$

[✓ 4. $\frac{8}{12} = \frac{4}{6}$] [✓ 5. $\frac{2}{3} = \frac{6}{9}$] 6. $\frac{4}{8} = \frac{0}{4}$

7. $\frac{1}{4} = \frac{5}{8}$ [✓ 8. $\frac{2}{10} = \frac{4}{20}$] [✓ 9. $\frac{5}{10} = \frac{1}{2}$]

BUILD

Is it the Same? Work with your Shoulder Partner. Create an equivalent model, record its fraction, and write as a decimal fraction.

1.

Fraction: $\frac{8}{10} = \frac{80}{100}$

Decimal: 0.8 = 0.80

88

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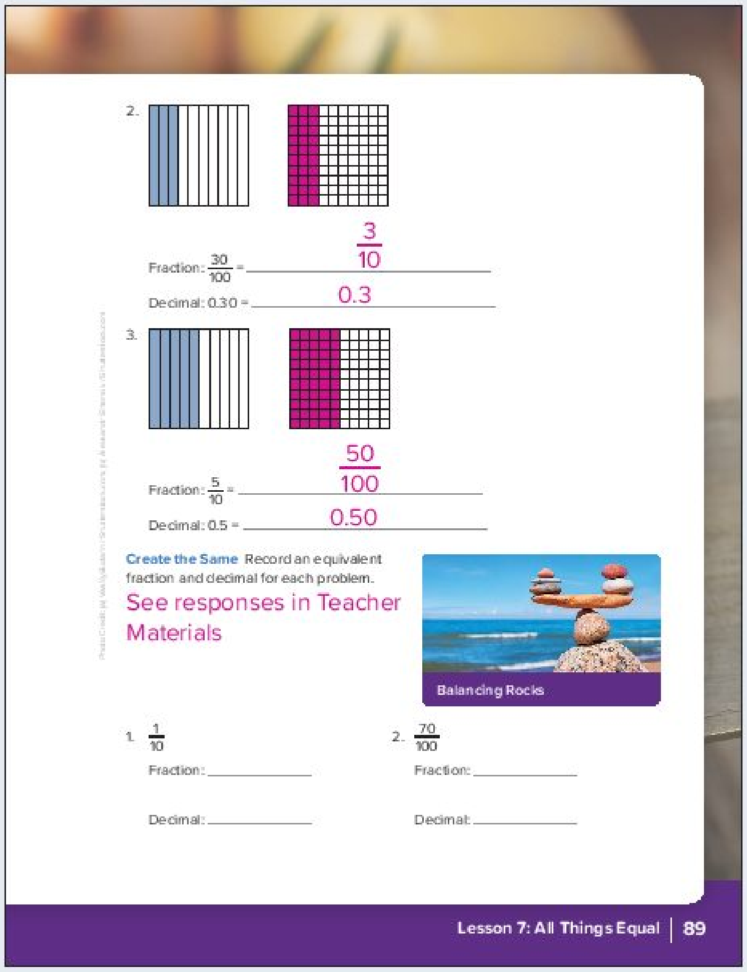
Student Page 89



2.

Fraction: $\frac{30}{100}$ = $\frac{3}{10}$

Decimal: 0.30 = 0.3

3.

Fraction: $\frac{5}{10}$ = $\frac{50}{100}$

Decimal: 0.5 = 0.50

Create the Same Record an equivalent fraction and decimal for each problem.

See responses in Teacher Materials

1. $\frac{1}{10}$

Fraction: ________

Decimal: ________

2. $\frac{70}{100}$

Fraction: ________

Decimal: ________

Lesson 7: All Things Equal | 89

BUILD (40 min)

Is It the Same? (20 min)

1. Direct students to Lesson 7 BUILD Is It the Same? Work with students to solve Problem 1. Ask students to guide the problem-solving process and share their thinking. Offer help as needed.
2. Ensure students understand that 0.8 and $\frac{8}{10}$ and 0.80 and $\frac{80}{100}$ are all equivalent because we can create a model that shows they are all the same size of the whole.
3. Ask students to work with their partner to solve Problems 2 and 3. After a few minutes, go over the answers together. Again, give students as much responsibility as possible for modeling and explaining their strategies and solutions.
4. Pose the following questions in relation to the last problem:

ASK

- *Is there another equivalent fraction for $\frac{5}{10}$ besides $\frac{50}{100}$?* $\frac{1}{2}$
- *If $\frac{1}{2}$ = $\frac{5}{10}$ how do you think $\frac{1}{2}$ is written as a decimal and why?* *Since $\frac{1}{2}$ is the same as $\frac{5}{10}$ the decimal, it is also written as 0.5*
- *If the fraction is a mixed number like $1\frac{5}{10}$ what do you think an equivalent mixed number looks like?* $1\frac{50}{100}$ or $1\frac{1}{2}$

5. Write $\frac{21}{100} = \frac{?}{10}$ on the board and ask students to think about whether or not they could find an equivalent fraction. There cannot be an equivalent fraction with a denominator of 10 because the denominator is decreased by 10 and 21 ÷ 10 does not have a whole number answer.

Answer Key for Is It the Same?:

1. $\frac{8}{10} = \frac{80}{800}$; 0.8 = 0.80
2. $\frac{30}{100} = \frac{3}{10}$; 0.30 = 0.3
3. $\frac{5}{10} = \frac{50}{100}$; 0.5 = 0.50

Create the Same (20 minutes)

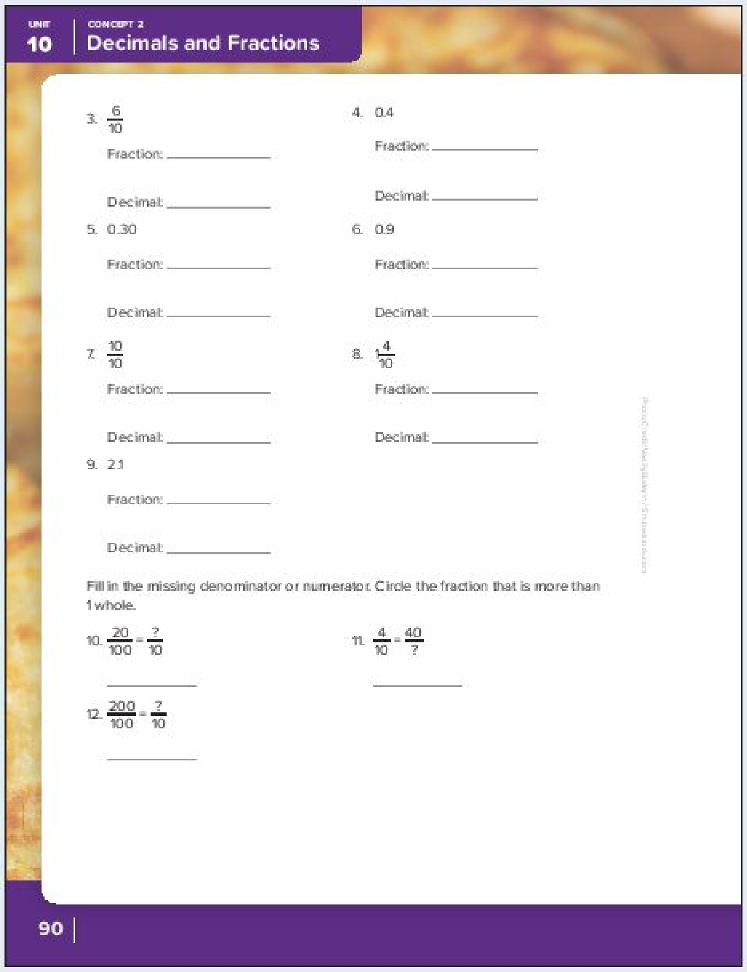
1. Ask students to turn to Lesson 7 BUILD Create the Same. Work with students to solve Problems 1–3. Give students as much responsibility as possible for identifying their problem-solving strategies and explaining their reasoning.
2. Ask students to complete Problems 4–9 independently, with a partner, or in a small group with you, depending on the needs of your students.
3. Give students time to work, and then go over the answers as a class. Ensure students can convert decimals to fractions and vice versa, creating several equivalencies.
4. Solve Problem 10 with students, asking students to share their problem-solving strategies and reasoning. Ask students to solve Problems 11 and 12 (independently, with a partner, or in a small group with you).
5. After a few minutes, go over the answers with students. Discuss errors and misconceptions and allow students to help each other build understanding.

Answer Key for Create the Same:

1. $\frac{10}{100}$; 0.1; 0.10
2. $\frac{7}{10}$; 0.70; 0.7
3. $\frac{60}{100}$; 0.6; 0.60
4. 0.40; $\frac{4}{10}$; $\frac{40}{100}$
5. 0.3; $\frac{30}{100}$; $\frac{3}{10}$
6. 0.90; $\frac{9}{10}$; $\frac{90}{100}$
7. $\frac{100}{100}$; 1.0; 1.00
8. $1\frac{40}{100}$; $\frac{140}{100}$; 1.4; 1.40
9. 2.10; $2\frac{1}{10}$; $\frac{21}{10}$; $2\frac{10}{100}$
10. $\frac{2}{10}$
11. $\frac{40}{100}$
12. $\frac{20}{10}$ (circled)

PRINT

Student Page 90



UNIT 10 | CONCEPT 2
Decimals and Fractions

3. $\frac{6}{10}$

Fraction: ______

Decimal: ______

4. 0.4

Fraction: ______

Decimal: ______

5. 0.30

Fraction: ______

Decimal: ______

6. 0.9

Fraction: ______

Decimal: ______

7. $\frac{10}{10}$

Fraction: ______

Decimal: ______

8. $1\frac{4}{10}$

Fraction: ______

Decimal: ______

9. 2.1

Fraction: ______

Decimal: ______

Fill in the missing denominator or numerator. Circle the fraction that is more than 1 whole.

10. $\frac{20}{100} = \frac{?}{10}$ ______

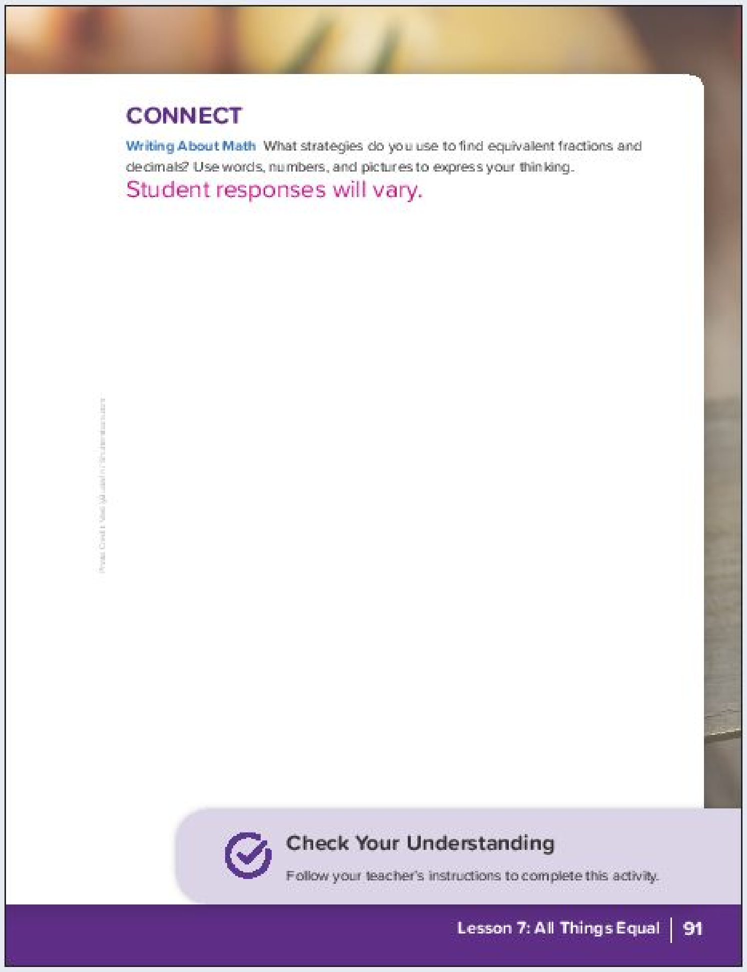
11. $\frac{4}{10} = \frac{40}{?}$ ______

12. $\frac{200}{100} = \frac{?}{10}$ ______

90

PRINT

Student Page 91



CONNECT

Writing About Math What strategies do you use to find equivalent fractions and decimals? Use words, numbers, and pictures to express your thinking.

Student responses will vary.

Check Your Understanding

Follow your teacher's instructions to complete this activity.

Lesson 7: All Things Equal | 91

CONNECT (7 min)

Writing About Math

Ask students to turn to Lesson 7 Writing About Math and respond to the prompt.

Answers will vary.

WRAP-UP (3 min)

Let's Chat About Our Learning

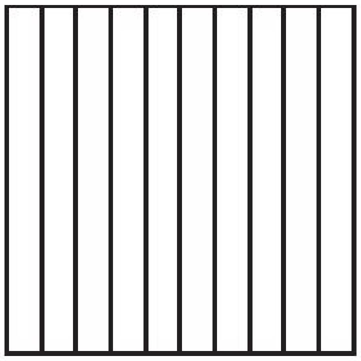
Ask students to share their responses to the Writing About Math prompt. Record students' strategies on chart paper to display in the classroom. Be sure to record only effective strategies. Encourage students to ask each other questions about their strategies.

PRACTICE

Direct students to Lesson 7 PRACTICE and have them complete the problems. Address student errors and misconceptions related to creating equivalent fractions and decimals to the Hundredths place.

Check Your Understanding

Zeina is making a blanket for her baby brother, Ziad. She has 100 small squares of fabric in red, blue, and green, her brother's favorite colors. She wants to make a blanket that has 10 strips like the one that follows, and decides that 10 of the small squares together will equal 1 strip. Use this information to solve the problems.



1. If Zeina wants 3 strips to be red, how many small squares will she need?
   30 squares
2. Zeina creates 3 red strips and sews them together. What fraction and decimal of the blanket is finished now? Write a fraction and decimal that represent the finished portion of the blanket.
   $\frac{3}{10}$ or $\frac{30}{100}$; .3 or .30
3. Next, Zeina wants to add 5 strips of blue. How many small blue squares will she need?
   50 squares
4. Zeina adds the new strips to the blanket. What fraction of the blanket is finished now? Write a fraction and decimal that represent the finished portion of the blanket.
   $\frac{8}{10}$ or $\frac{80}{100}$; .8 or .80
5. Write a fraction and decimal that represent the portion of the blanket that will be green. Explain how you know.
   $\frac{2}{10}$ or 0.2 will be green because $\frac{8}{10}$ (.8) of the blanket is red and blue. That leaves 2 strips or $\frac{2}{10}$ of the blanket to create $\frac{10}{10}$ or a whole.

Materials List

- Materials may vary

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DIGITAL

Concept Check-In and Remediation

Quick Code:
egmt4148

Concept Check-In and Remediation

Lesson Overview

In this lesson, students work to correct misconceptions and errors from Concept 2: Decimals and Fractions. First, administer the Concept Check-In. Once you have reviewed the quiz results, choose remediation activities based on the needs of your students. Some recommendations are listed in the chart, but the needs of your particular students should inform your choices. Students may work independently, in pairs, or in a small group with the teacher.

Concept Essential Question

- What strategies can I use to find equivalent fractions and decimals?

Learning Objective

In this lesson

- Students will work to correct misconceptions and errors related to the relationship between decimals and fractions.

Grade-Level Standards

4.B.3.a Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100 (for example: express $\frac{2}{10}$ as $\frac{20}{100}$ and add $\frac{2}{10} + \frac{5}{100} = \frac{25}{100}$).

4.B.3.b Use decimal notation for fractions with denominators 10 or 100 (for example, write $\frac{62}{100}$ as .62).

Vocabulary Check-In

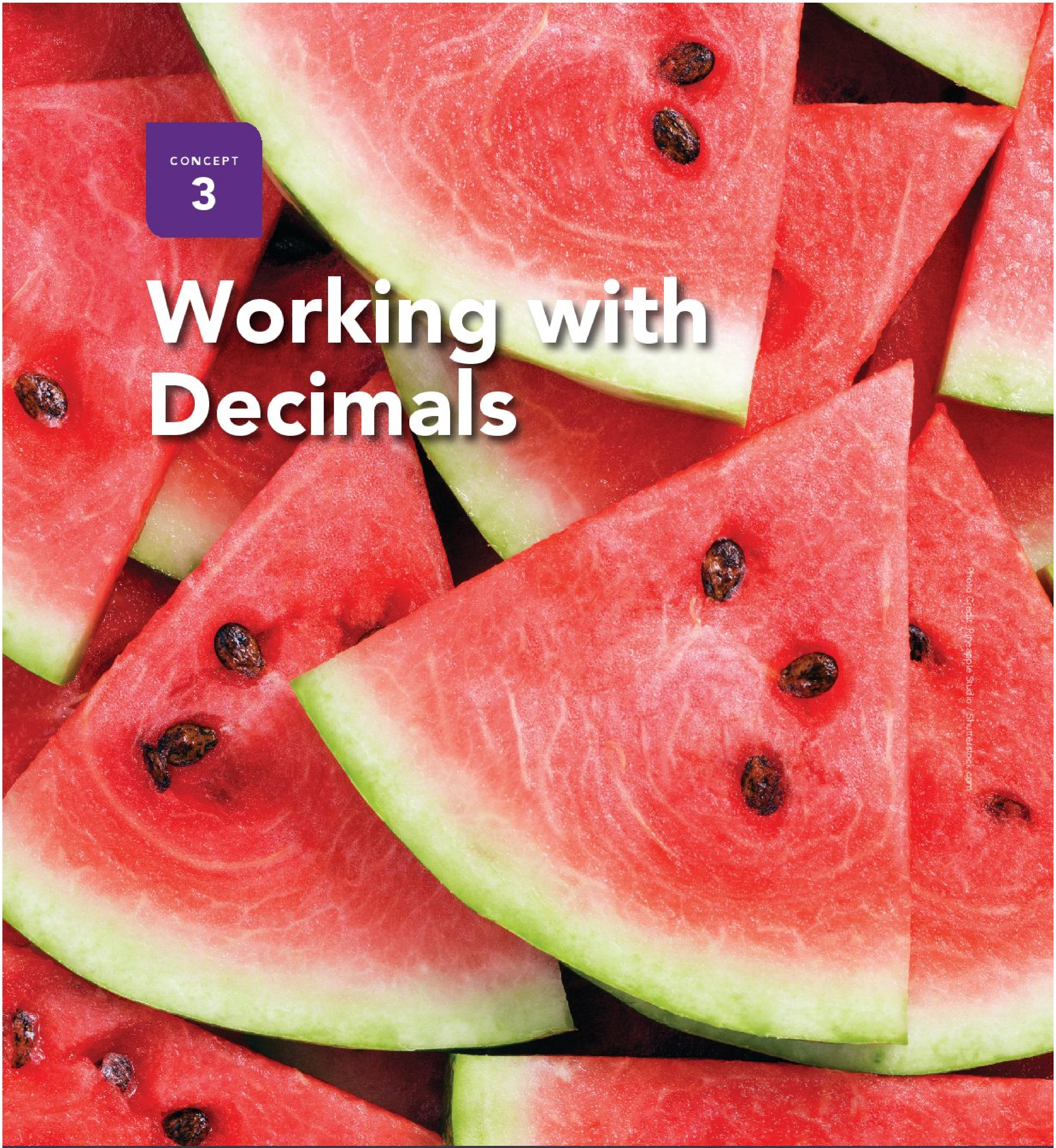
Review concept vocabulary as needed.

COMMON MISCONCEPTIONS AND ERRORS

- Students may struggle to write a decimal as a fraction.
- Students may struggle to understand how many Tenths or Hundredths are in whole numbers.
- Students may confuse Tenths and Hundredths believing that 0.4 is not equal to 0.40 because 40 > 4.
- Students may increase the denominator but not the numerator to find an equivalent fraction (for example, $\frac{3}{10} = \frac{3}{100}$).

Remediation: Correcting Misconceptions

If... Students are unable to write a decimal as a fraction.	**Then...** Review Lesson 5 BUILD. Create similar problems for students to solve using models that are shaded to help students find the decimal and fraction equivalent. Begin by focusing on Tenths. Make sure there is solid understanding of Tenths before moving to Hundredths.
If... Students struggle to understand how many Tenths or Hundredths are in whole numbers.	**Then...** Review Lesson 6. Give students similar problems and ask them to use the models in ACCESS to solve the problems. Students could also create their own whole models for Tenths and Hundredths to refer to.
If... Students confuse Tenths and Hundredths believing that 0.4 is not equal to 0.40 because 40 > 4.	**Then...** Review Lesson 7. Provide many visual models and ask students to color in equivalent Tenths and Hundredths. Play games in which students match two visual models and two decimal numbers that are equivalent.
If... Students increase the denominator but not the numerator to find an equivalent fraction (for example, $\frac{3}{10} = \frac{3}{100}$).	**Then...** Have students color in a fraction on the Tenths grid, such as $\frac{2}{10}$, and then color the same quantity on a Hundredths grid model and use a diagram similar to the one used in Unit 9 to show the connection between the numerator and the denominator and how both increase by the same amount. $\overset{\times 10}{\underset{\times 10}{\frac{2}{10} = \frac{20}{100}}}$



CONCEPT

3

Working with Decimals

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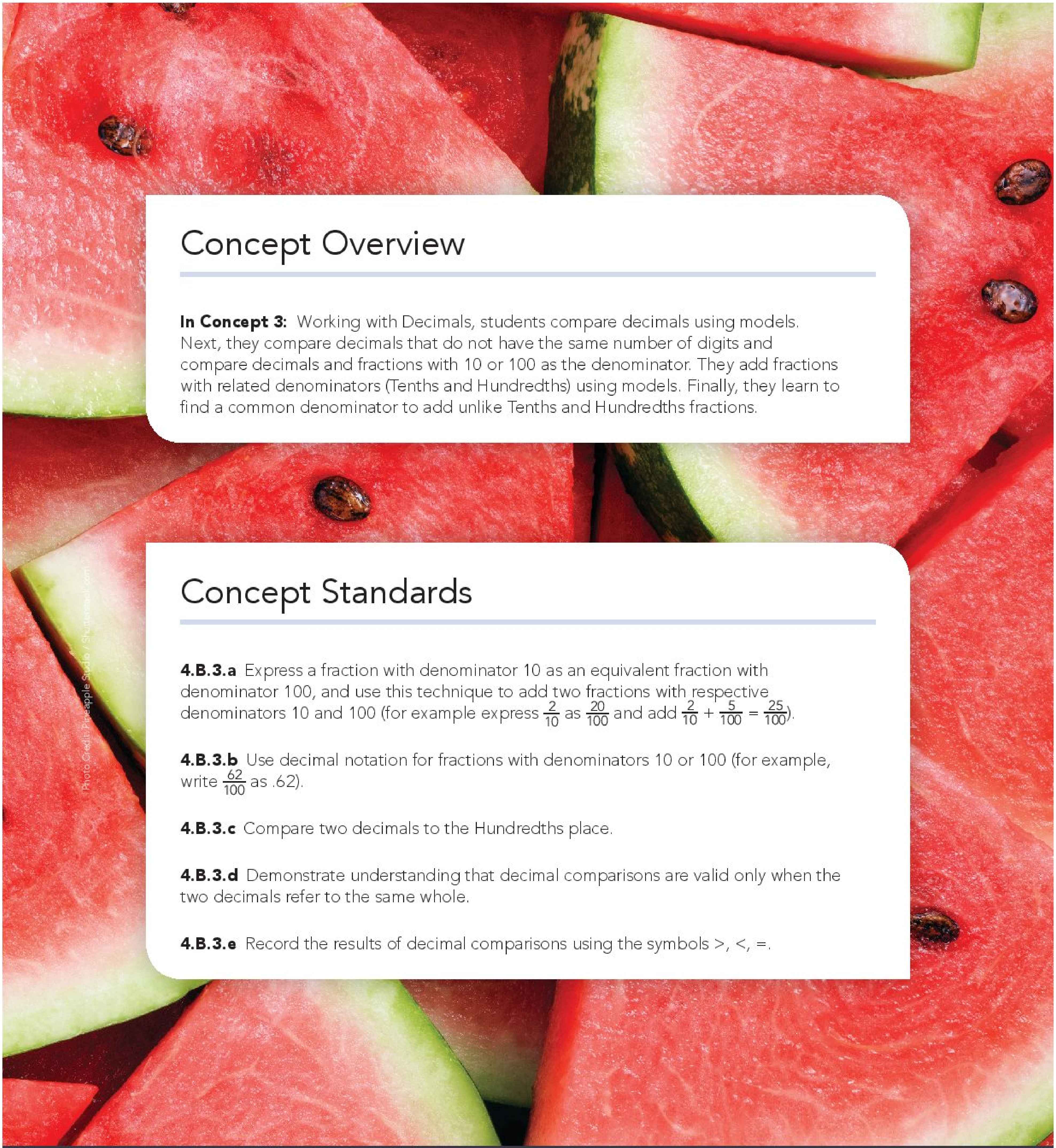

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Concept Overview

In Concept 3: Working with Decimals, students compare decimals using models. Next, they compare decimals that do not have the same number of digits and compare decimals and fractions with 10 or 100 as the denominator. They add fractions with related denominators (Tenths and Hundredths) using models. Finally, they learn to find a common denominator to add unlike Tenths and Hundredths fractions.

Concept Standards

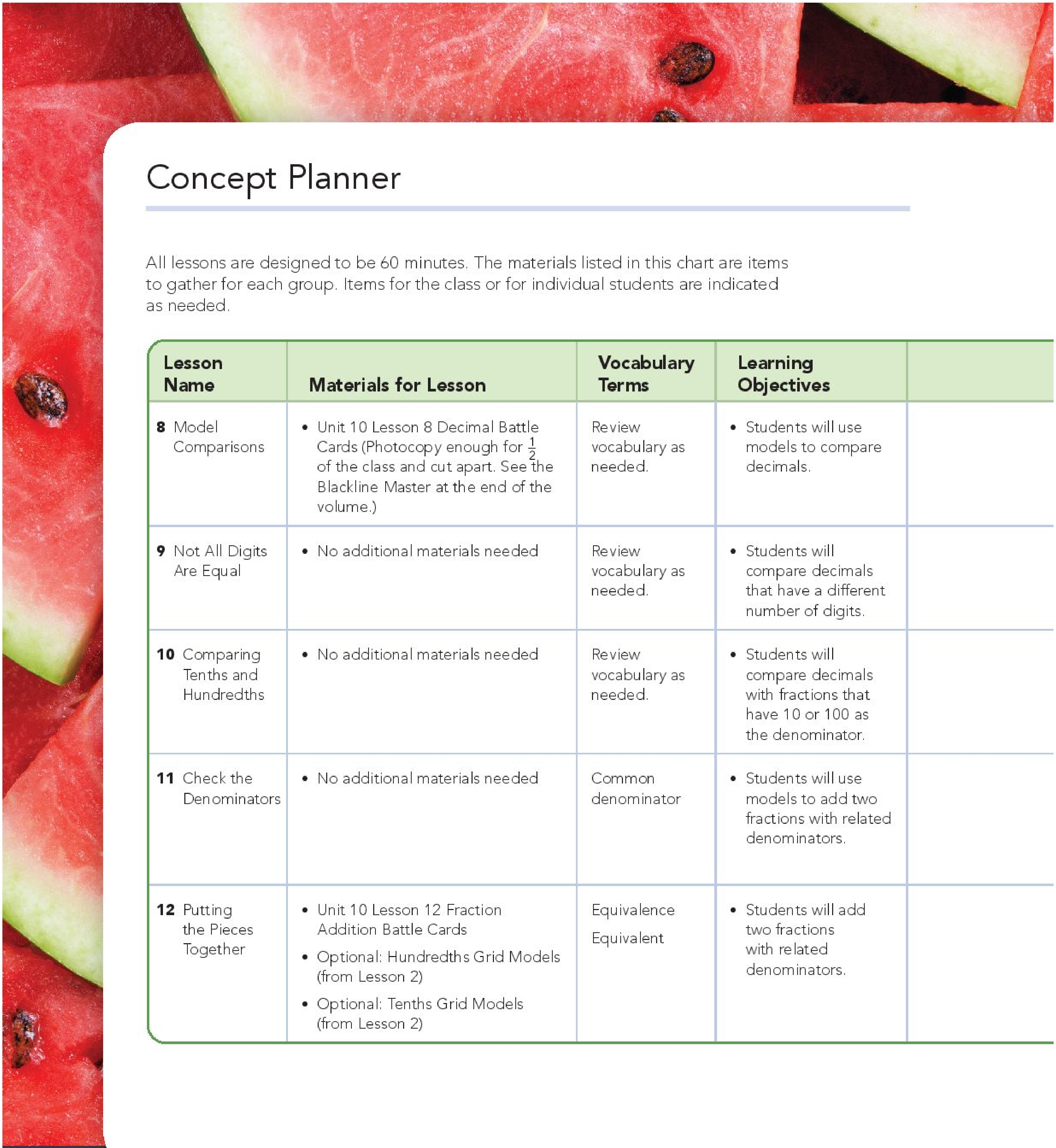
4.B.3.a Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100 (for example express $\frac{2}{10}$ as $\frac{20}{100}$ and add $\frac{2}{10} + \frac{5}{100} = \frac{25}{100}$).

4.B.3.b Use decimal notation for fractions with denominators 10 or 100 (for example, write $\frac{62}{100}$ as .62).

4.B.3.c Compare two decimals to the Hundredths place.

4.B.3.d Demonstrate understanding that decimal comparisons are valid only when the two decimals refer to the same whole.

4.B.3.e Record the results of decimal comparisons using the symbols >, <, =.

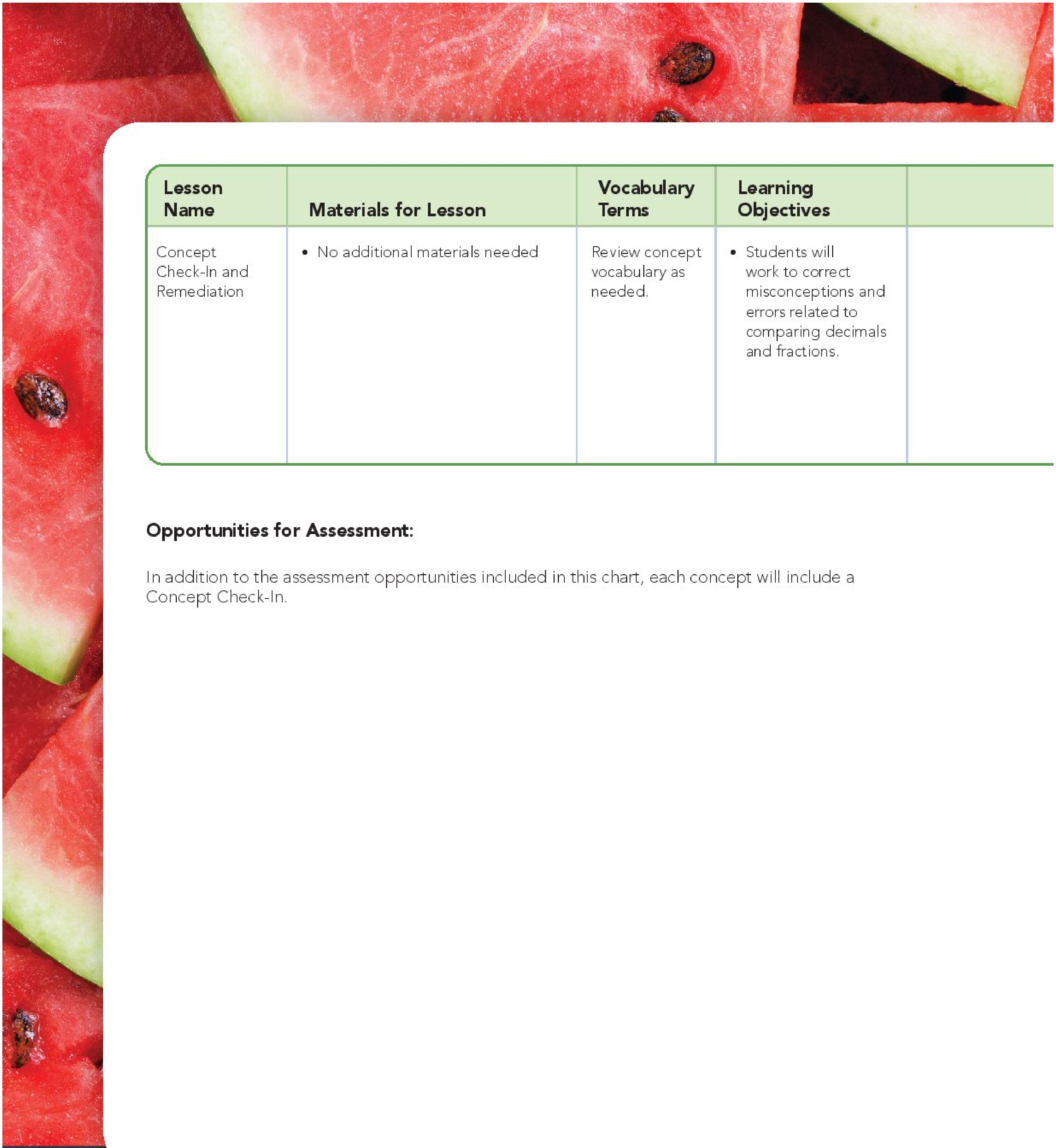


Concept Planner

All lessons are designed to be 60 minutes. The materials listed in this chart are items to gather for each group. Items for the class or for individual students are indicated as needed.

Lesson Name	Materials for Lesson	Vocabulary Terms	Learning Objectives	
8 Model Comparisons	• Unit 10 Lesson 8 Decimal Battle Cards (Photocopy enough for $\frac{1}{2}$ of the class and cut apart. See the Blackline Master at the end of the volume.)	Review vocabulary as needed.	• Students will use models to compare decimals.	
9 Not All Digits Are Equal	• No additional materials needed	Review vocabulary as needed.	• Students will compare decimals that have a different number of digits.	
10 Comparing Tenths and Hundredths	• No additional materials needed	Review vocabulary as needed.	• Students will compare decimals with fractions that have 10 or 100 as the denominator.	
11 Check the Denominators	• No additional materials needed	Common denominator	• Students will use models to add two fractions with related denominators.	
12 Putting the Pieces Together	• Unit 10 Lesson 12 Fraction Addition Battle Cards • Optional: Hundredths Grid Models (from Lesson 2) • Optional: Tenths Grid Models (from Lesson 2)	Equivalence Equivalent	• Students will add two fractions with related denominators.	

	Common Misconceptions and Errors	Opportunities for Formative Assessment
	• Students may think that decimals with more digits have a greater value without looking at the units.	Which is More?, Renaming Review, Decimal Battle, Writing About Math, Practice, Check Your Understanding
	• Students may think that decimals with more digits have a greater value without looking at the units.	Error Analysis, Chart and Compare, At the Market, Writing About Math, Practice, Check Your Understanding
	• Students may struggle to rewrite fractions and decimals into matching forms before they compare.	Pairs of Lines, Intersecting or Not?, Writing About Math, Practice, Check Your Understanding
	• Students may struggle to see the equivalence between Tenths and Hundredths and move between the two models. • Students may add the numerators and denominators separately when adding fractions with unlike denominators (for example, $\frac{3}{10} + \frac{40}{100} \neq \frac{43}{110}$).	Same Units, Writing About Math, Practice, Check Your Understanding
	• Students may add the numerators and denominators separately when adding fractions with unlike denominators (for example, $\frac{3}{10} + \frac{40}{100} \neq \frac{43}{110}$).	Error Analysis, Model Free Addition, Making Equivalent Fractions, Fraction Face-Off, Writing About Math, Practice, Check Your Understanding



Lesson Name	Materials for Lesson	Vocabulary Terms	Learning Objectives	
Concept Check-In and Remediation	• No additional materials needed	Review concept vocabulary as needed.	• Students will work to correct misconceptions and errors related to comparing decimals and fractions.	

Opportunities for Assessment:

In addition to the assessment opportunities included in this chart, each concept will include a Concept Check-In.

	Common Misconceptions and Errors	Opportunities for Formative Assessment
	• Students may think that decimals with more digits have a greater value without looking at the units. • Students may struggle to rewrite fractions and decimals into matching forms before they compare. • Students may struggle to see the equivalence between Tenths and Hundredths and move between the two models. • Students may add the numerators and denominators separately when adding fractions with unlike denominators (for example, $\frac{3}{10} + \frac{40}{100} \neq \frac{43}{110}$).	

LESSON 8
Model Comparisons

Lesson Overview

In this lesson, students compare decimals to the Hundredths using various models. Students consider the size of the unit rather than looking at the numbers in isolation. Students recognize that comparisons are valid only when the two decimals refer to the same whole.

Essential Question

- How is determining the value of decimals and whole numbers similar and different?

Learning Objective

In this lesson

- Students will use models to compare decimals.

Grade-Level Standards

4.B.3.c Compare two decimals to the Hundredths place.

4.B.3.d Demonstrate understanding that decimal comparisons are valid only when the two decimals refer to the same whole.

4.B.3.e Record the results of decimal comparisons using the symbols >, <, =.

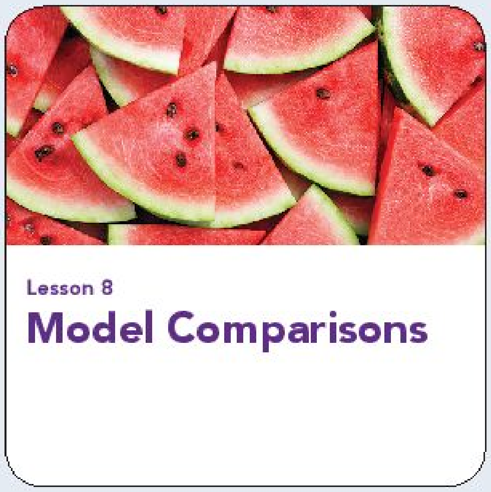
Vocabulary Check-In

Review vocabulary as needed.

Materials List

- Unit 10 Lesson 8 Decimal Battle Cards (Photocopy enough for $\frac{1}{2}$ of the class and cut apart. See the Blackline Master at the end of the volume.)

DIGITAL



Lesson 8

Model Comparisons

Quick Code:
egmt4149

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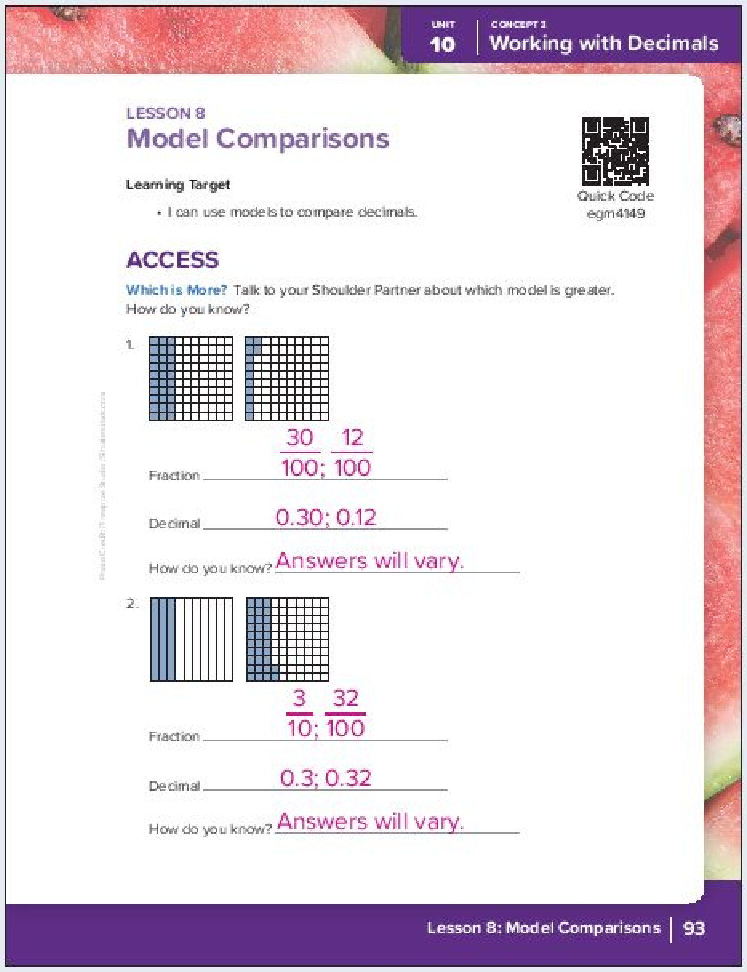
Student Page 93



UNIT 10 | CONCEPT 3 Working with Decimals

LESSON 8

Model Comparisons

Learning Target

- I can use models to compare decimals.

Quick Code egm4149

ACCESS

Which is More? Talk to your Shoulder Partner about which model is greater. How do you know?

1\.

Fraction $\frac{30}{100}$; $\frac{12}{100}$

Decimal 0.30; 0.12

How do you know? Answers will vary.

2\.

Fraction $\frac{3}{10}$; $\frac{32}{100}$

Decimal 0.3; 0.32

How do you know? Answers will vary.

Lesson 8: Model Comparisons | 93

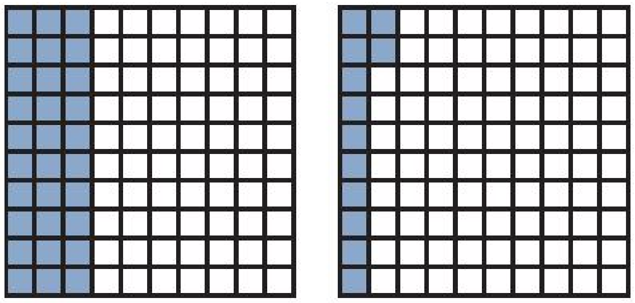
ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may think that decimals with more digits have a greater value without looking at the units.

Which is More?

1. Direct students to Lesson 8 ACCESS Which is More? and chorally read the Learning Target.
2. Ask students to talk to their Shoulder Partner about the models in Problem 1. After 1–2 minutes, use an Attention-Getting Signal to bring students back together to share their thinking.
3. Ask volunteers to record the fraction and decimal beneath each model on the board. All students should record the numbers in their Student Materials. Remind students to use 100 as the denominator, since the whole has been divided into hundredths.



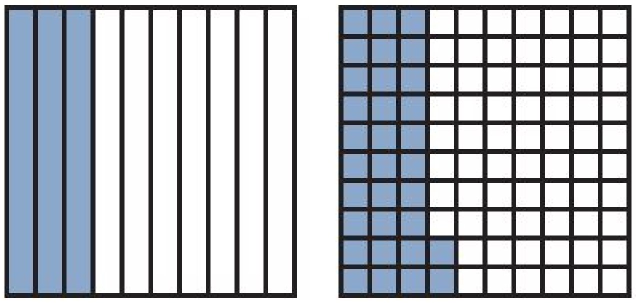
Fraction: $\frac{30}{100}$
Decimal: 0.30 or
30 Hundredths

Fraction: $\frac{12}{100}$
Decimal: 0.12 or
12 Hundredths

4. Ask students how a model is helpful when comparing two decimals. Models help us compare decimals visually. The model that has more shading is greater. Therefore 0.30 (30 Hundredths) is greater than 0.12 (12 Hundredths).

5. Write on the board 0.30 > 0.12 and 0.12 < 0.30.

6. Direct students' attention to the models in Problem 2 and ask them to record decimals and fractions that represent the two models.



7. Explain to students that although one model uses Tenths and the other model uses Hundredths, they can still visually see which decimal is greater. The models are the same size, just divided up differently.

8. Ask students to share a comparison sentence about this model.
   0.4 or 4 Tenths is greater than 0.33 or 33 Hundredths or .33 or 33 Hundredths is less than 0.4 or 4 Tenths)

9. Write on the board 0.4 > 0.33 and 0.33 < .4.

TEACHER NOTE: If students struggle to compare the models in Problem 2, have them draw 9 horizontal lines on the first model to create 10 rows. Students may count the individual boxes and see that 40 Hundredths is greater than 33 Hundredths.

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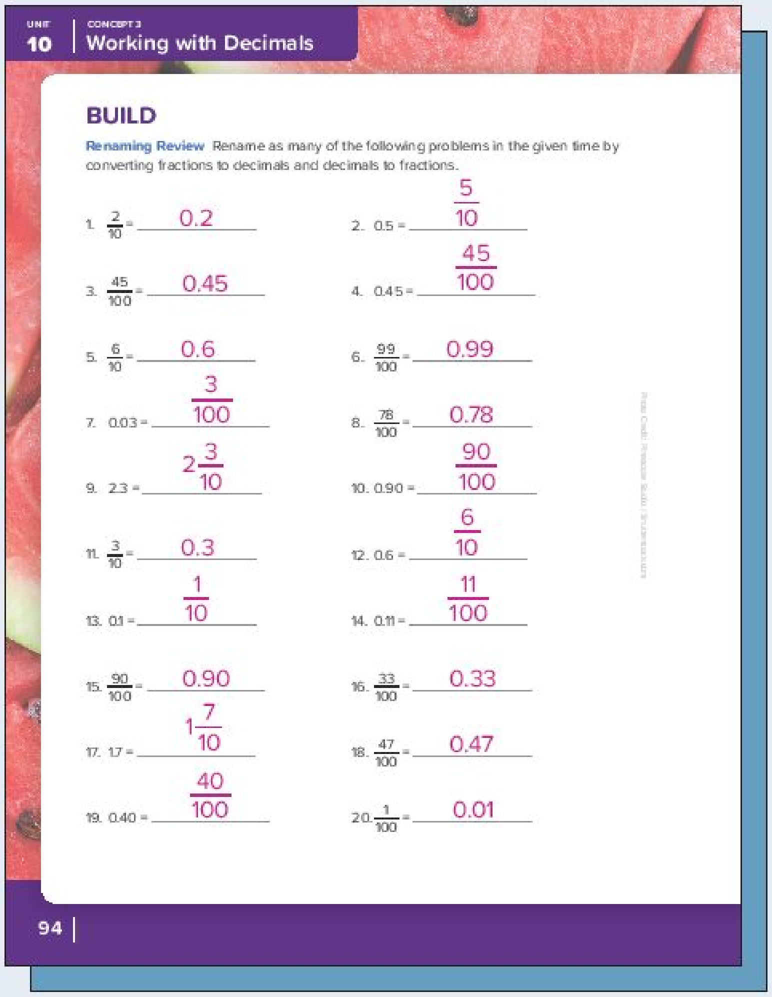
Student Pages 94–95



UNIT 10 | CONCEPT 3 Working with Decimals

BUILD

Renaming Review Rename as many of the following problems in the given time by converting fractions to decimals and decimals to fractions.

1. $\frac{2}{10}$ = 0.2

2. 0.5 = $\frac{5}{10}$

3. $\frac{45}{100}$ = 0.45

4. 0.45 = $\frac{45}{100}$

5. $\frac{6}{10}$ = 0.6

6. $\frac{99}{100}$ = 0.99

7. 0.03 = $\frac{3}{100}$

8. $\frac{78}{100}$ = 0.78

9. 2.3 = $2\frac{3}{10}$

10. 0.90 = $\frac{90}{100}$

11. $\frac{3}{10}$ = 0.3

12. 0.6 = $\frac{6}{10}$

13. 0.1 = $\frac{1}{10}$

14. 0.11 = $\frac{11}{100}$

15. $\frac{90}{100}$ = 0.90

16. $\frac{33}{100}$ = 0.33

17. 1.7 = $1\frac{7}{10}$

18. $\frac{47}{100}$ = 0.47

19. 0.40 = $\frac{40}{100}$

20. $\frac{1}{100}$ = 0.01

94

BUILD (40 min)

Renaming Review (20 min)

1. Divide the class into 2 groups.
2. Explain that one group will work independently to complete Lesson 8 BUILD Renaming Review while the other half of the class will work with you to play a game, Lesson 8 BUILD Decimal Battle. Tell students that after about 15 minutes they will switch to the other learning experience.
3. Direct the independent group to Lesson 8 BUILD Renaming Review to begin working.

	Standard Form	Word Form	Fraction Form	Expanded Form
21.	3.2	three and two tenths	$3\frac{2}{10}$	3 + 0.2
22.	7.43	seven and forty-three hundredths	$7\frac{43}{100}$	7 + 0.4 + 0.03
23.	1.17	one and seventeen hundredths	$1\frac{17}{100}$	1 + 0.1 + 0.07
24.	3.8	three and eight tenths	$3\frac{8}{10}$	3 + 0.8
25.	0.45	forty-five hundredths	$\frac{45}{100}$	0.4 + 0.05

Decimal Battle (20 min)

1. Gather your group together and distribute a set of Decimal Battle cards to each pair.
2. Explain to your group that the cards have a decimal number, an area model, or a number line on them.
3. Explain the directions to the game:
    - Shuffle the cards and give them out to you and your partner, face down, until zero cards remain.
    - Each player flips over their top card.
    - Players compare the two cards to see which player's card has the greater value. The player with the greater value keeps both of the cards.
    - Record your comparison statements in your Student Materials.
    - The player with the most cards at the end of 10 rounds is the winner.
    - If time permits, play Game 2.
4. After 15 minutes, switch groups and have students begin working on their assigned learning activity.
5. Use the last 5–10 minutes of BUILD to discuss the following:

ASK
- *What was successful today about the split classroom?*
- *What was challenging?*
- *What strategies did you use to compare cards in Decimal Battle?*
- *How confident are you renaming decimals and fractions?*

Answer Key for Decimal Battle:
Answers will vary based on cards chosen by players. Check Student Materials to assess understanding and accuracy.

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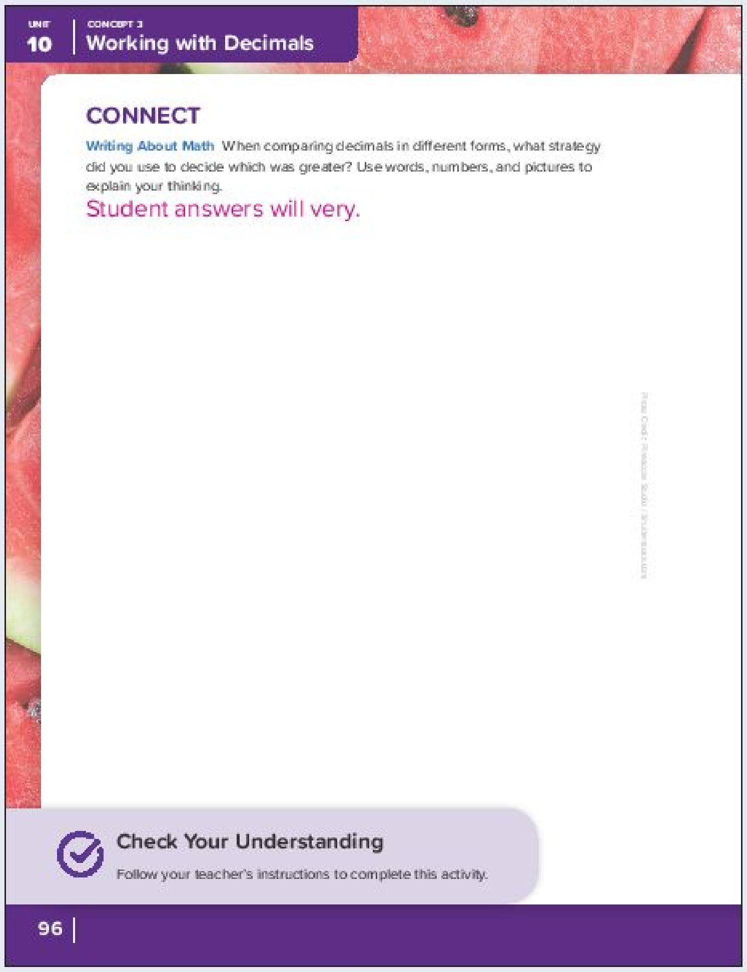
Student Page 96



UNIT 10 | CONCEPT 3 Working with Decimals

CONNECT

Writing About Math When comparing decimals in different forms, what strategy did you use to decide which was greater? Use words, numbers, and pictures to explain your thinking.

Student answers will very.

Check Your Understanding

Follow your teacher's instructions to complete this activity.

96

CONNECT (7 min)

Writing About Math

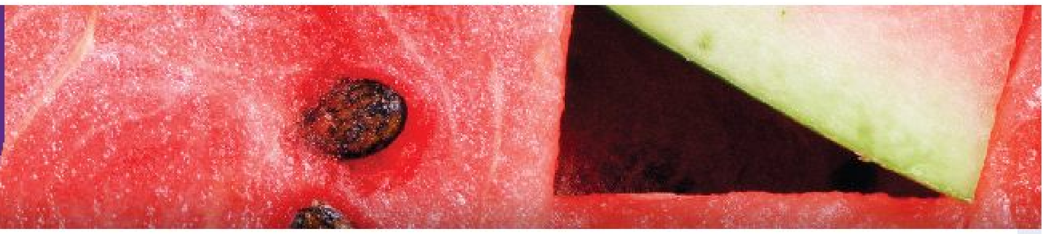
Ask students to turn to Lesson 8 CONNECT Writing About Math and answer the question.

Answers will vary.

WRAP-UP (3 min)

Let's Chat About Our Learning

Ask students share their responses to the Writing About Math question. Encourage students to ask questions of each other to build understanding.



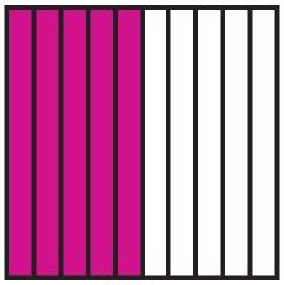
PRACTICE

Direct students to Lesson 8 PRACTICE and have them complete the problems. Address student errors and misconceptions related to using models to compare decimals.

Check Your Understanding

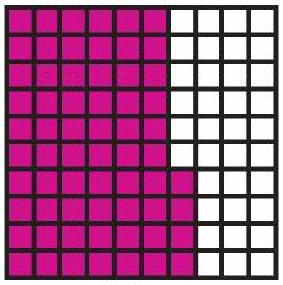
Complete each math sentence by writing >, <, or =. Then, color in the models to check your work.

1.



0.5

<



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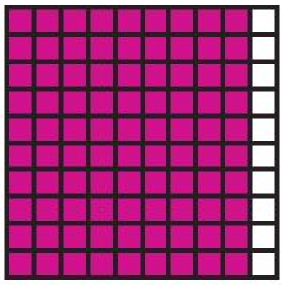
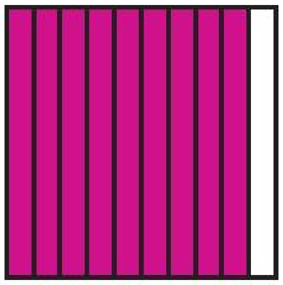
2.



0.90

=



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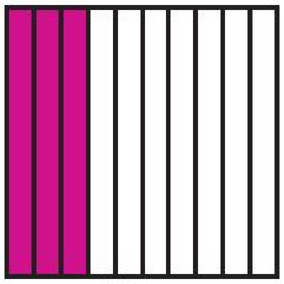
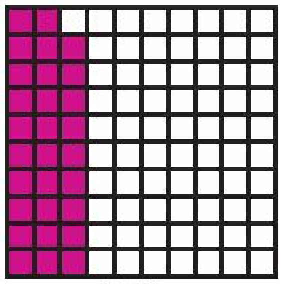
3.



0.3

>



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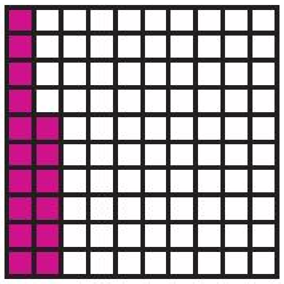
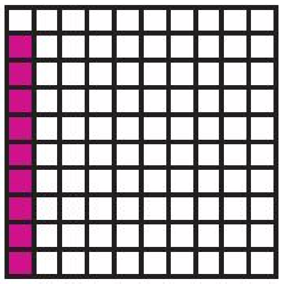
4.



0.16

>



0.09

Materials List

- No additional materials needed

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DIGITAL

Lesson 9

Not All Digits Are Equal

Quick Code:
egmt4150

LESSON 9
Not All Digits Are Equal

Lesson Overview

In this lesson, students compare the value of two decimals with the same digit in a different place value using a model. They compare decimals with different numbers of digits by using a place value chart.

Essential Question

- How is determining the value of decimals and whole numbers similar and different?

Learning Objective

In this lesson

- Students will compare decimals that have a different number of digits.

Grade-Level Standards

4.B.3.c Compare two decimals to the Hundredths place.

4.B.3.d Demonstrate understanding that decimal comparisons are valid only when the two decimals refer to the same whole.

4.B.3.e Record the results of decimal comparisons using the symbols >, <, =.

Vocabulary Check-In

Review vocabulary as needed.

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may think that decimals with more digits have a greater value without looking at the units.

Error Analysis

1. Ask students to turn to Lesson 9 ACCESS Error Analysis and ask students to complete the error analysis.
2. After a few minutes, use Calling Sticks to choose students to share their answers to the error analysis.

Answer Key for Error Analysis:
Answers will vary, but students should note that the student was able to correctly compare the models, but did not color the models correctly. The student colored in the Tenths model for seven hundredths and the Hundredths model for seven-tenths.

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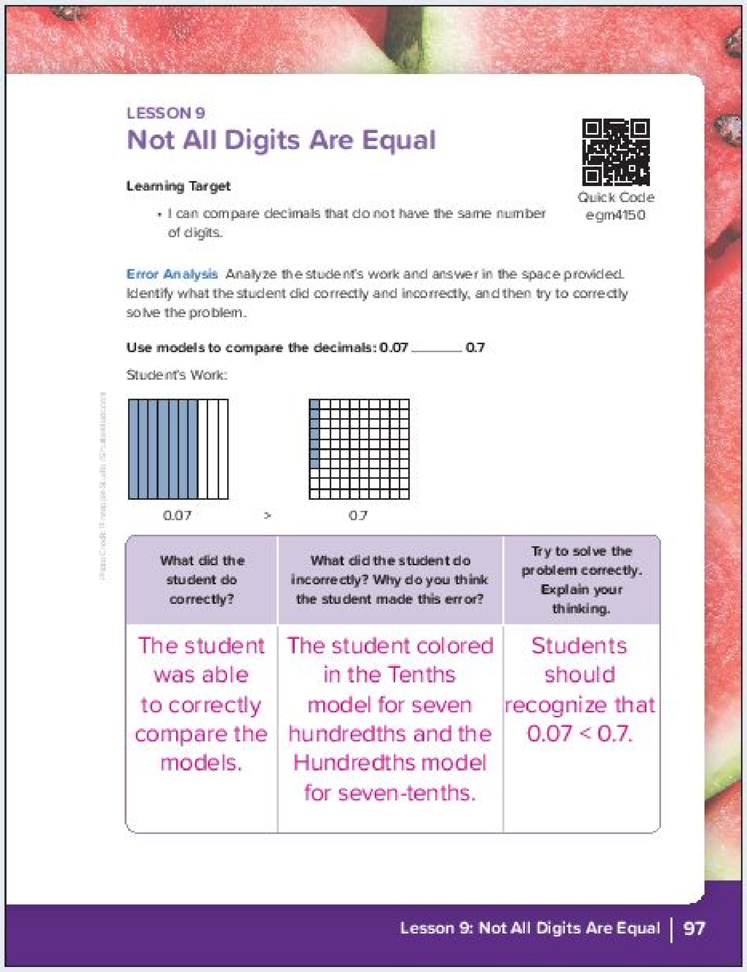
Student Page 97



LESSON 9

Not All Digits Are Equal

Quick Code
egm4150

Learning Target

- I can compare decimals that do not have the same number of digits.

Error Analysis Analyze the student's work and answer in the space provided. Identify what the student did correctly and incorrectly, and then try to correctly solve the problem.

Use models to compare the decimals: 0.07 ______ 0.7

Student's Work:

0.07 > 0.7

What did the student do correctly?	What did the student do incorrectly? Why do you think the student made this error?	Try to solve the problem correctly. Explain your thinking.
The student was able to correctly compare the models.	The student colored in the Tenths model for seven hundredths and the Hundredths model for seven-tenths.	Students should recognize that 0.07 < 0.7.

Lesson 9: Not All Digits Are Equal | 97

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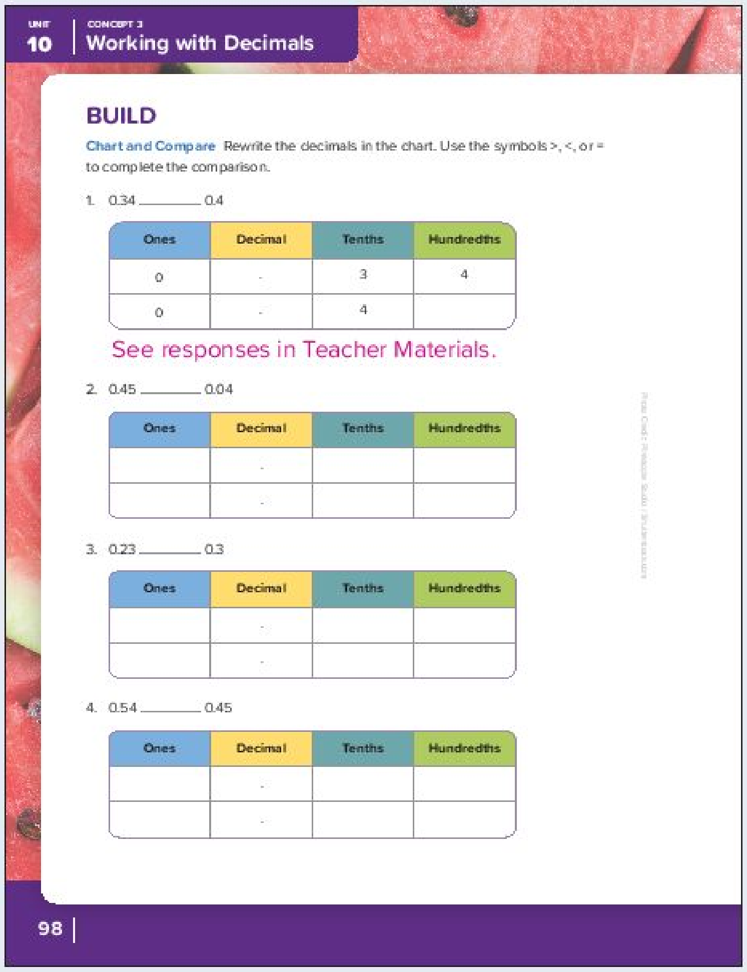
Student Page 98



UNIT 10 | CONCEPT 3 Working with Decimals

BUILD

Chart and Compare Rewrite the decimals in the chart. Use the symbols >, <, or = to complete the comparison.

1. 0.34 ________ 0.4

Ones	Decimal	Tenths	Hundredths
0	.	3	4
0	.	4	

See responses in Teacher Materials.

2. 0.45 ________ 0.04

Ones	Decimal	Tenths	Hundredths
	.		
	.		

3. 0.23 ________ 0.3

Ones	Decimal	Tenths	Hundredths
	.		
	.		

4. 0.54 ________ 0.45

Ones	Decimal	Tenths	Hundredths
	.		
	.		

98

BUILD (40 min)

Chart and Compare (20 min)

1. Ask students to Turn and Talk to a partner about how they would compare the decimals 0.34 and 0.4. Use Calling Sticks to choose students to share their comparing strategies.

2. Remind students that in Lesson 8 they used models to compare decimals. Today they will use the place value chart to compare decimals that have different numbers of digits.

3. Direct students to Lesson 9 BUILD Chart and Compare. Ask students how the place value chart might help them compare decimals. Allow students to share their thinking. Confirm correct and effective use of the place value chart to compare numbers. Work with students to complete Problem 1.

TEACHER NOTE: This may be a difficult concept for students, especially if they see a larger digit in the Hundredths place. Encourage students to pay attention to the zeroes. For example, in comparing 0.09 and 0.11, students should note there is a zero in the Tenths place but a 9 in the Hundredths place and in the other number there is a 1 in the Tenths place and a 1 in the Hundredths place. The second number (0.11) is larger because there is a digit other than zero in the Tenths place. One Tenth is greater than zero Tenths. Students may also find it helpful to think about the comparison of similarly sized decimals. So in the previous example, $\frac{11}{100}$ is greater than $\frac{9}{100}$ because 11 parts is more than 9 parts.

4. Ask students to complete Problems 2–10 either independently, with a partner, or in a small group with you, depending on the needs of your students.

5. At the end of the segment, go over the answers with students.

Answer Key for Chart and Compare:

1. 0.34 < 0.4
2. 0.45 > 0.04

Ones	Decimal	Tenths	Hundredths
0	.	4	5
0	.	0	4

3. 0.23 < 0.3

Ones	Decimal	Tenths	Hundredths
0	.	2	3
0	.	3	

4. 0.54 > 0.45

Ones	Decimal	Tenths	Hundredths
0	.	5	4
0	.	4	5

5. 0.62 > 0.26

Ones	Decimal	Tenths	Hundredths
0	.	6	2
0	.	2	6

6. 0.80 > 0.09

Ones	Decimal	Tenths	Hundredths
0	.	8	0
0	.	0	9

7. 0.73 > 0.69

Ones	Decimal	Tenths	Hundredths
0	.	7	3
0	.	6	9

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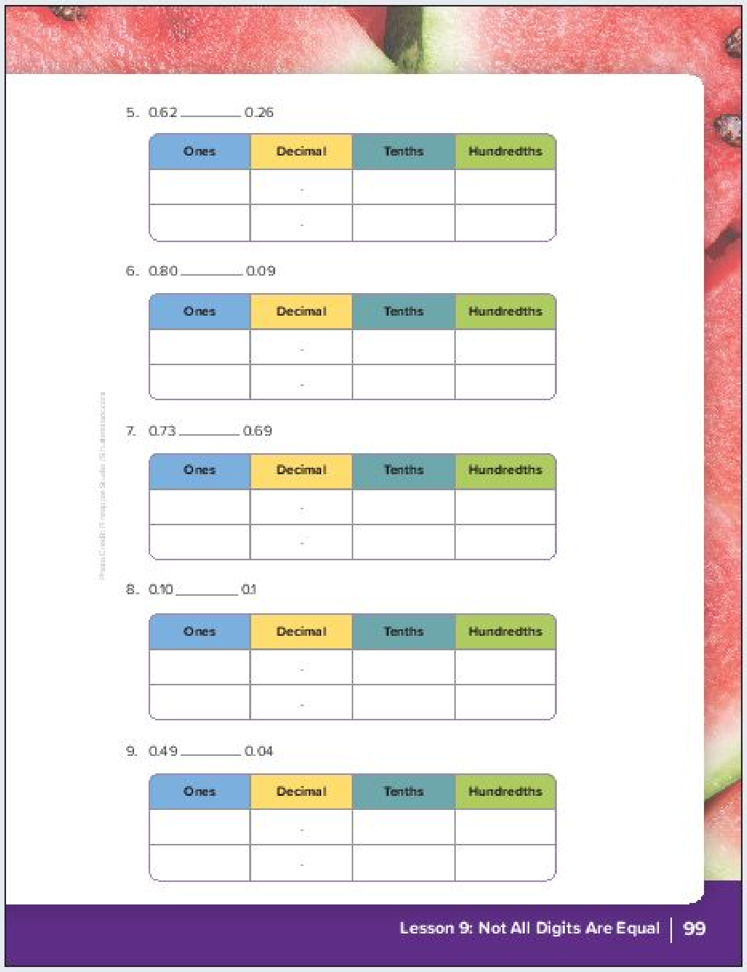
Student Page 99



5. 0.62 ________ 0.26

Ones	Decimal	Tenths	Hundredths
	.		
	.		

6. 0.80 ________ 0.09

Ones	Decimal	Tenths	Hundredths
	.		
	.		

7. 0.73 ________ 0.69

Ones	Decimal	Tenths	Hundredths
	.		
	.		

8. 0.10 ________ 0.1

Ones	Decimal	Tenths	Hundredths
	.		
	.		

9. 0.49 ________ 0.04

Ones	Decimal	Tenths	Hundredths
	.		
	.		

Lesson 9: Not All Digits Are Equal | 99

8. 0.10 = 0.1

Ones	Decimal	Tenths	Hundredths
0	.	1	0
0	.	1	

9. 0.49 > 0.04

Ones	Decimal	Tenths	Hundredths
0	.	4	9
0	.	0	4

10. 0.27 < 0.7

Ones	Decimal	Tenths	Hundredths
0	.	2	7
0	.	7	

At the Market (20 min)

1. Direct student to Lesson 9 BUILD At the Market. Answer any questions students may have, and then ask them to complete the task independently.
2. Use the last 5–8 minutes of BUILD to review the answers as a class and check the fill in the blank comparison questions.

Answer Key for At the Market:

Fruit	Ones	Decimal	Tenths	Hundredths
Figs	1	.	3	
Mango	2	.	0	1
Plums	1	.	2	1
Pomegranate	2	.	2	5

1. Which item weighs the least? Plums
2. Which item weighs the most? Pomegranate
3. Which items weigh more than the plums? Figs, Mango, Pomegranate
4. Which items weigh less than the mango? Figs, Plums
5. Answers will vary.
6. Answers will vary.

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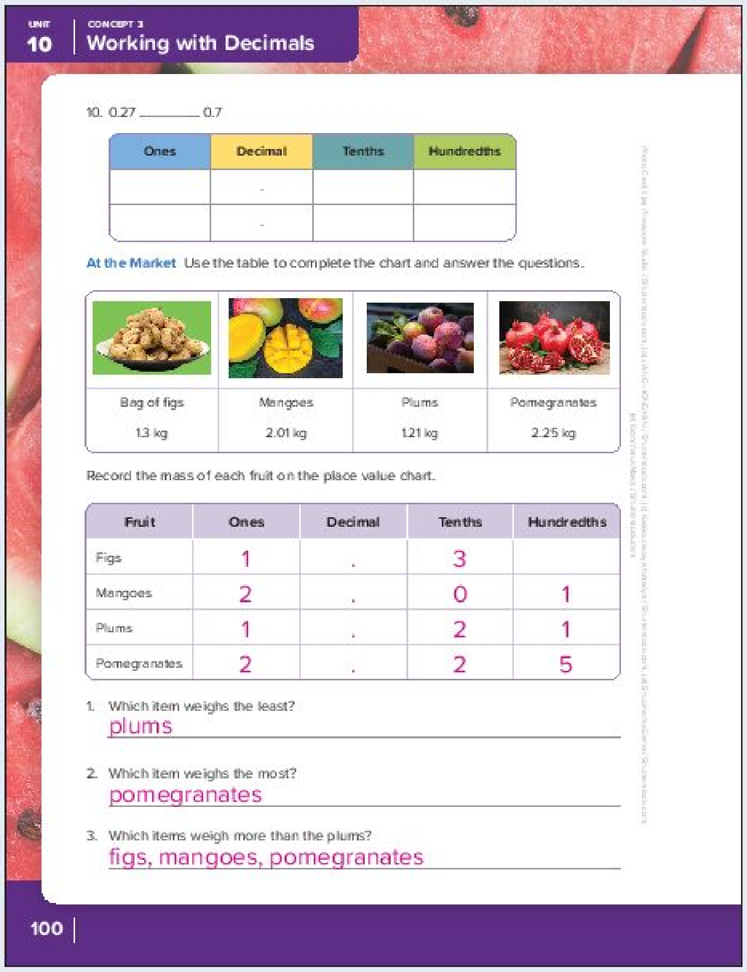
Student Page 100



UNIT 10 | CONCEPT 3 Working with Decimals

10. 0.27 ________ 0.7

Ones	Decimal	Tenths	Hundredths
	.		
	.		

At the Market Use the table to complete the chart and answer the questions.

Bag of figs	Mangoes	Plums	Pomegranates
1.3 kg	2.01 kg	1.21 kg	2.25 kg

Record the mass of each fruit on the place value chart.

Fruit	Ones	Decimal	Tenths	Hundredths
Figs	1	.	3	
Mangoes	2	.	0	1
Plums	1	.	2	1
Pomegranates	2	.	2	5

1. Which item weighs the least?
plums
2. Which item weighs the most?
pomegranates
3. Which items weigh more than the plums?
figs, mangoes, pomegranates

100

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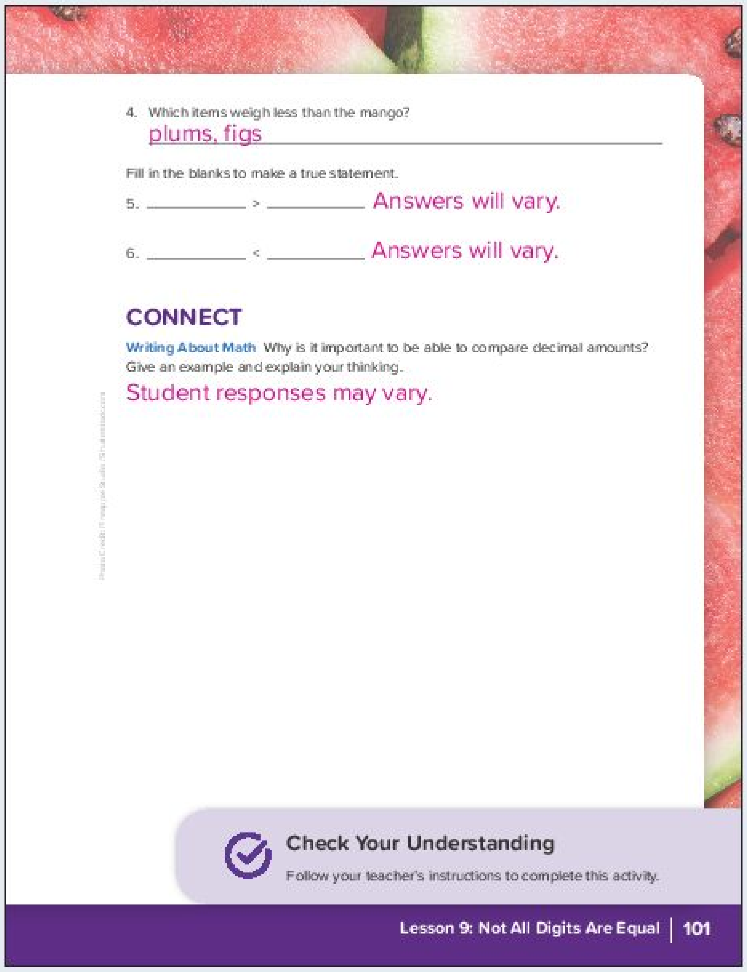
Student Page 101



4. Which items weigh less than the mango?

plums, figs

Fill in the blanks to make a true statement.

5. ________ > ________ Answers will vary.

6. ________ < ________ Answers will vary.

CONNECT

Writing About Math Why is it important to be able to compare decimal amounts? Give an example and explain your thinking.

Student responses may vary.

Check Your Understanding

Follow your teacher's instructions to complete this activity.

Lesson 9: Not All Digits Are Equal | 101

CONNECT (7 min)

Writing About Math

Ask students to turn to Lesson 9 CONNECT Writing About Math to respond to the question.

Answer Key for Writing About Math:
Answers will vary, but students should provide an example of when they might need to compare decimals in real-world scenarios.

WRAP-UP (3 min)

Let's Chat About Our Learning

Use Calling Sticks to choose students to share their answers. If students were unable to answer the question, ask them to call on a classmate for help.

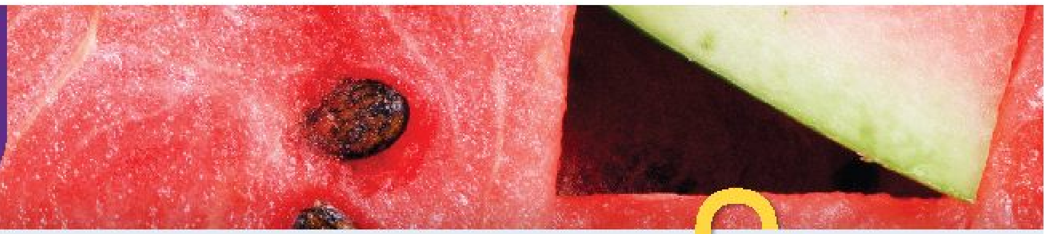
PRACTICE

Direct students to Lesson 9 PRACTICE and have them complete the problems. Address student errors and misconceptions related to using place value models to compare decimals.

Check Your Understanding

Use the symbols <, >, = to compare the decimal numbers. Use any comparison strategy you like.

1. $0.25 < 0.3$
2. $0.9 = 0.90$
3. $2.5 > 2.43$
4. $6.07 < 6.7$
5. $0.18 < 0.2$
6. $5.65 > 4.89$



LESSON 10
Comparing Tenths and Hundredths

Lesson Overview

In this lesson, students compare decimals and fractions with a 10 or 100 as the denominator. They rewrite decimals and fractions in different forms to compare. They plot decimals and fractions on a line and solve problems with the information plotted. They also compare fractions and decimals in word problems.

Essential Question

- How is determining the value of decimals and whole numbers similar and different?

Learning Objective

In this lesson

- Students will compare decimals with fractions that have 10 or 100 as the denominator.

Grade-Level Standards

4.B.3.b Use decimal notation for fractions with denominators 10 or 100 (for example, write $\frac{62}{100}$ as .62).

4.B.3.c Compare two decimals to the Hundredths place.

4.B.3.d Demonstrate understanding that decimal comparisons are valid only when the two decimals refer to the same whole.

4.B.3.e Record the results of decimal comparisons using the symbols >, <, =.

Vocabulary Check-In

Review vocabulary as needed.

Materials List

- No additional materials needed

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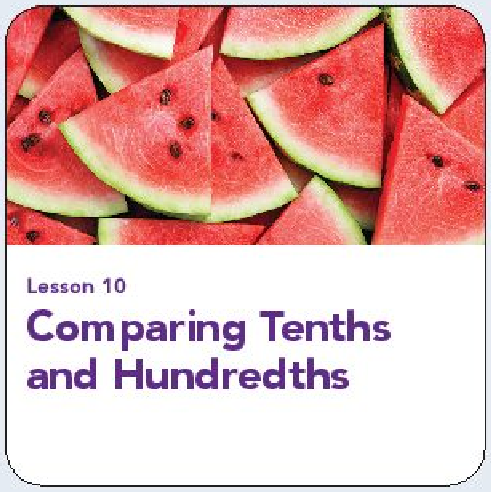

Lesson 10
Comparing Tenths and Hundredths

Quick Code:
egmt4151

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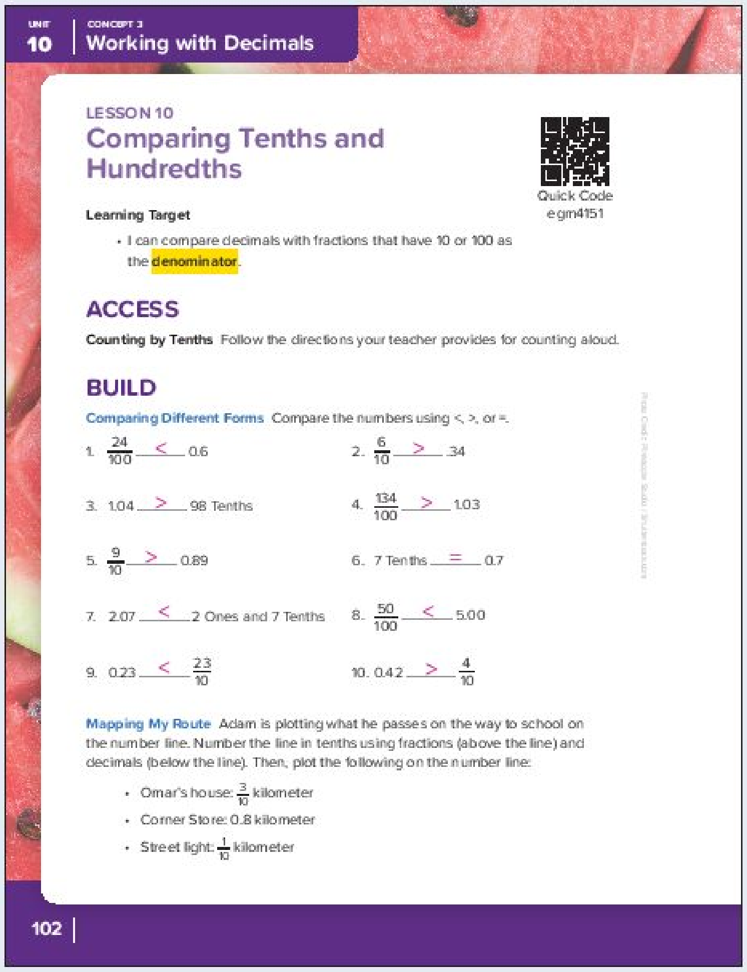
Student Page 102



UNIT 10 | CONCEPT 3 **Working with Decimals**

LESSON 10

Comparing Tenths and Hundredths

Quick Code
egm4151

Learning Target

- I can compare decimals with fractions that have 10 or 100 as the **denominator**.

ACCESS

Counting by Tenths Follow the directions your teacher provides for counting aloud.

BUILD

Comparing Different Forms Compare the numbers using <, >, or =.

1. $\frac{24}{100}$ __<__ 0.6
2. $\frac{6}{10}$ __>__ .34
3. 1.04 __>__ 98 Tenths
4. $\frac{134}{100}$ __>__ 1.03
5. $\frac{9}{10}$ __>__ 0.89
6. 7 Tenths __=__ 0.7
7. 2.07 __<__ 2 Ones and 7 Tenths
8. $\frac{50}{100}$ __<__ 5.00
9. 0.23 __<__ $\frac{23}{10}$
10. 0.42 __>__ $\frac{4}{10}$

Mapping My Route Adam is plotting what he passes on the way to school on the number line. Number the line in tenths using fractions (above the line) and decimals (below the line). Then, plot the following on the number line:

- Omar's house: $\frac{3}{10}$ kilometer
- Corner Store: 0.8 kilometer
- Street light: $\frac{1}{10}$ kilometer

102

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may struggle to rewrite fractions and decimals into matching forms before they compare.

Counting by Tenths

1. Ask students to count by Ones to 10 starting at zero. Write the numbers on the board as students count aloud.
2. Ask students to count by Tenths to 10 Tenths, starting at zero Tenths. Write the numbers on the board as students count aloud.
   $\frac{0}{10}, \frac{1}{10}, \frac{2}{10}, \frac{3}{10}, \frac{4}{10}, \frac{5}{10}, \frac{6}{10}, \frac{7}{10}, \frac{8}{10}, \frac{9}{10}, \frac{10}{10}$
3. Ask students another name for $\frac{10}{10}$. 1
4. Ask students to count by Tenths to 10 again, but to say 1 when they reach $\frac{10}{10}$. Change $\frac{10}{10}$ to 1 on the board.
   $\frac{0}{10}, \frac{1}{10}, \frac{2}{10}, \frac{3}{10}, \frac{4}{10}, \frac{5}{10}, \frac{6}{10}, \frac{7}{10}, \frac{8}{10}, \frac{9}{10}, 1$
5. Tell students that this time they will count from zero Tenths to 1 using decimals. They will start with zero in decimal form. Write the numbers on the board as students count aloud.
   0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1
6. Ask students to compare the numbers they said aloud when they counted by fractions and decimals. Tell students they will be comparing decimals to fractions in today's lesson.

BUILD (40 min)

Comparing Different Forms (25 min)

1. Direct student to Lesson 10 BUILD Comparing Different Forms and chorally read the Learning Targets. Ask students to discuss how today's Learning Targets are different from those in the previous lesson.

2. Direct students to Problem 1. Ask students to talk to their Shoulder Partner about how they might compare these two numbers. Ask volunteers to share their thinking.
   Accept all reasonable answers.

3. Tell students that when comparing fractions and decimals, it is helpful to put the two numbers in the same form. They can either change both numbers to decimals or to fractions. They can then more easily compare the numbers using their preferred strategy.

4. Model the solution to Problem 1 both ways, by converting both numbers into fractions and then by converting both numbers into decimals. Tell students that a quick way to compare decimals without a place value chart is to vertically line up the numbers with their decimal points. Students can then compare moving from left to right. Clear up any confusion of misconceptions before moving on.
   - Example:

     0.6
     0.24

5. Ask students to complete Problems 2–10 on their own.

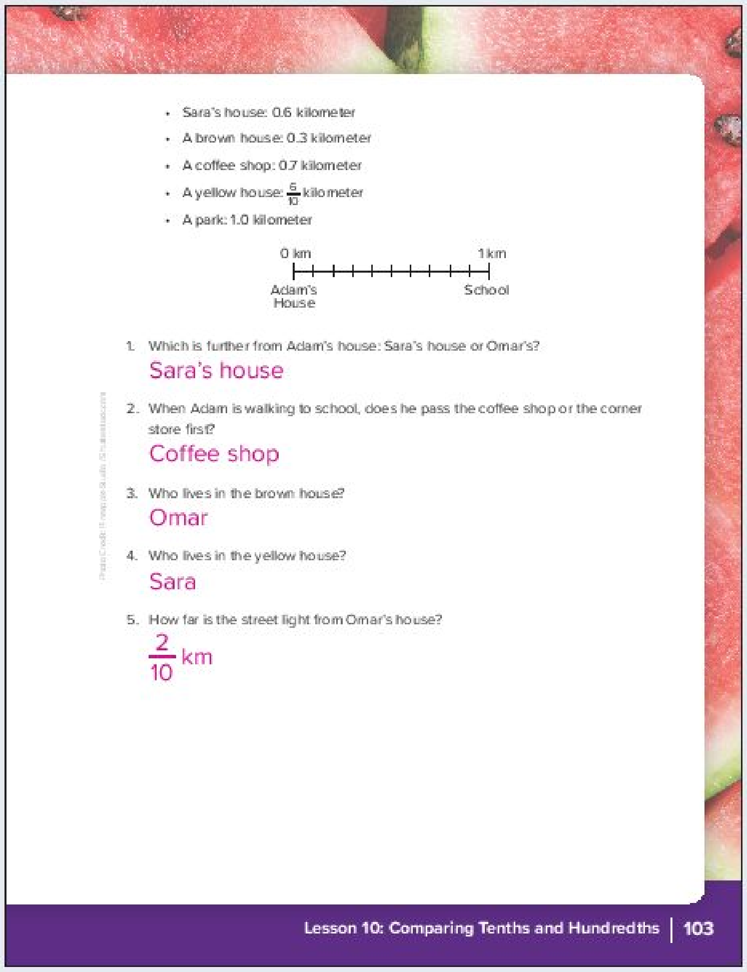
6. At the end of the segment, go over the answers with students. Discuss Problems 4 and 7 and model their solutions on the board if necessary.

Answer Key for Comparing Different Forms:

1. $\frac{24}{100} < \frac{6}{10}$
2. $\frac{6}{10} > .34$
3. 1.04 > 98 Tenths
4. $\frac{134}{100} > 1.03$

PRINT

Student Page 103



- Sara's house: 0.6 kilometer
- A brown house: 0.3 kilometer
- A coffee shop: 0.7 kilometer
- A yellow house: $\frac{6}{10}$ kilometer
- A park: 1.0 kilometer

1. Which is further from Adam's house: Sara's house or Omar's?
   Sara's house
2. When Adam is walking to school, does he pass the coffee shop or the corner store first?
   Coffee shop
3. Who lives in the brown house?
   Omar
4. Who lives in the yellow house?
   Sara
5. How far is the street light from Omar's house?
   $\frac{2}{10}$ km

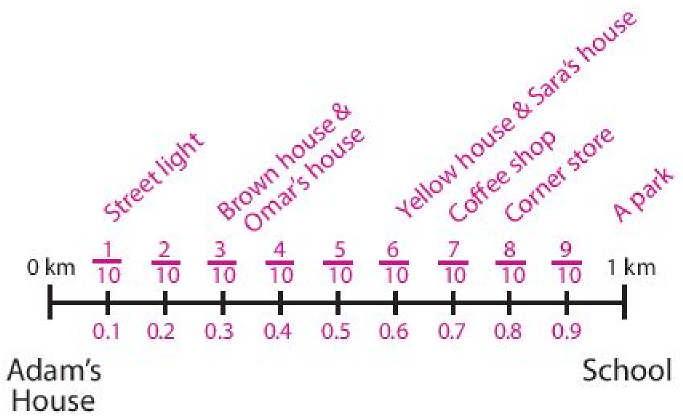
Lesson 10: Comparing Tenths and Hundredths | 103

5. $\frac{9}{10} > 0.89$
6. 7 Tenths = 0.7
7. 2.07 < 2 Ones and 7 Tenths
8. $\frac{50}{100} < 5.00$
9. $0.23 < \frac{23}{10}$
10. $0.42 > \frac{4}{10}$

Mapping My Route (15 min)

1. Direct students to Lesson 10 BUILD Mapping My Route.
2. Explain to students they will be plotting places on the number line and that there may be more than one place at each point.
3. After answering any questions students have, ask them to begin working (independently or with a partner). As students work, draw a number line on the board and label Adam's house and School. Make 9 marks on the number line to divide it into 10 equal spaces.
4. Use the last few minutes of BUILD to go over the answers with the class. Ask students to record their answers on your number line. Ask those students to share their comparison strategies.

Answer Key for Mapping My Route:


Street light
Brown house &
Omar's house
Yellow house & Sara's house
Coffee shop
Corner store
A park
0 km
$\frac{1}{10}$
$\frac{2}{10}$
$\frac{3}{10}$
$\frac{4}{10}$
$\frac{5}{10}$
$\frac{6}{10}$
$\frac{7}{10}$
$\frac{8}{10}$
$\frac{9}{10}$
1 km
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
Adam's
House
School

1. Sara's house
2. Coffee shop
3. Omar
4. Sara
5. $\frac{2}{10}$ km (or 0.2 km)

CONNECT (7 min)

Writing About Math

Ask students to turn to Lesson 10 CONNECT Writing About Math and respond to the prompt.

Answer Key for Writing About Math:
The second bottle (0.73 liters) contained more olive oil. Students' explanations may vary.

TEACHER NOTE: Consider collecting Student Materials to review this prompt as a formative assessment.

WRAP-UP (3 min)

Let's Chat About Our Learning

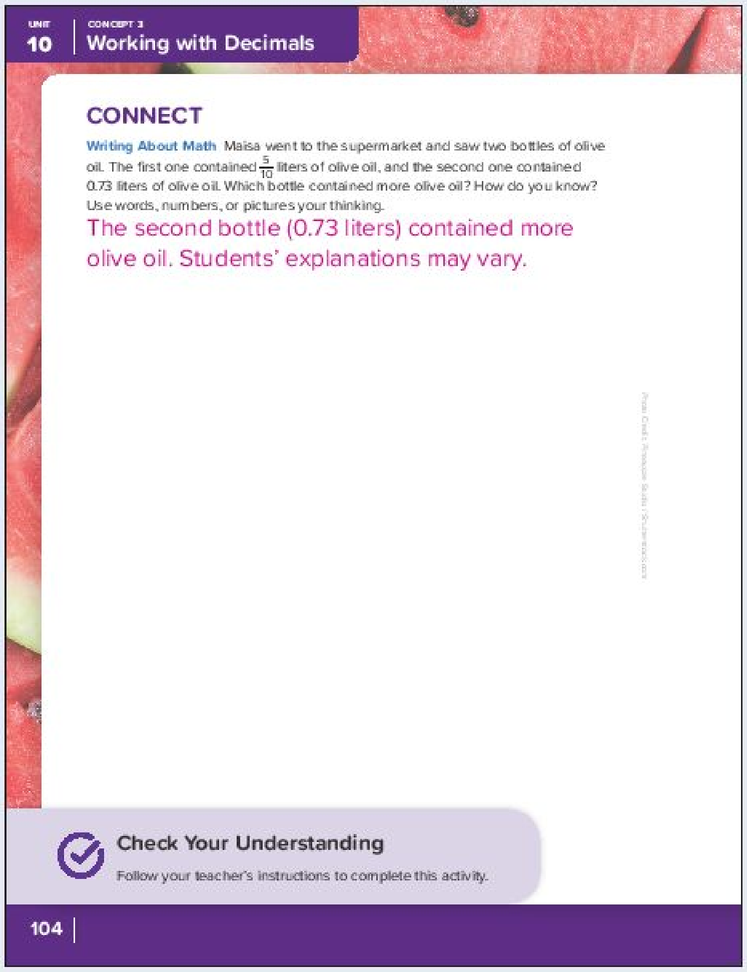
Ask students to discuss the following question: *How is determining the value of decimals and whole numbers similar and different?* Encourage students to use examples to support their thinking.
Students may see that both whole numbers and decimal values can be determined by going left to write by place value. They may also see that, with whole numbers, the number with the most number of digits is always greater, but that is not always the case with decimals.

PRACTICE

Direct students to Lesson 10 PRACTICE and have them complete the problems. Address student errors and misconceptions related to comparing decimals with fractions that have 10 or 100 as the denominator.

PRINT

Student Page 104



UNIT 10 | CONCEPT 3 Working with Decimals

CONNECT

Writing About Math Maisa went to the supermarket and saw two bottles of olive oil. The first one contained $\frac{5}{10}$ liters of olive oil, and the second one contained 0.73 liters of olive oil. Which bottle contained more olive oil? How do you know? Use words, numbers, or pictures your thinking.

The second bottle (0.73 liters) contained more olive oil. Students' explanations may vary.

Check Your Understanding
Follow your teacher's instructions to complete this activity.

104

Check Your Understanding

Compare each number using the symbols <, >, or =.

1. $\frac{3}{10} = 0.30$
2. $0.04 < \frac{4}{10}$
3. $0.67 > \frac{5}{10}$
4. Ali completed 0.25 of his chores. Aya completed $\frac{5}{10}$ of her chores. Who completed more chores?
Aya completed more chores. $0.25 < 0.5$
5. Hend has two friends: Jana and Malak. Jana is 0.75 cm shorter than Hend. Malak is $\frac{1}{10}$ cm shorter than Hend. Who is taller, Jana or Malak?
Malak is taller. $0.75 > 0.1$

Materials List

- No additional materials needed

Photo Credit: Africa Studio / Shutterstock.com

DIGITAL

Lesson 11

Check the Denominators

Quick Code:
egmt4152

LESSON 11
Check the Denominators

Lesson Overview

In this lesson, students use visual models to add fractions with related denominators. They identify and create visual models and decompose them to find a common denominator and determine the sum.

Essential Question

- What strategies can I use for adding fractions with related denominators?

Learning Objective

In this lesson

- Students will use models to add two fractions with related denominators.

Grade-Level Standard

4.B.3.a Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100 (for example express $\frac{2}{10}$ as $\frac{20}{100}$ and add $\frac{2}{10} + \frac{5}{100} = \frac{25}{100}$).

Vocabulary Check-In

common denominator

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may struggle to see the equivalence between Tenths and Hundredths and move between the two models.
- Students may add the numerators and denominators separately when adding fractions with unlike denominators (for example, $\frac{3}{10} + \frac{40}{100} \neq \frac{43}{100}$).

Skip Counting by Tenths

1. Ask students to count by Tenths starting at zero Tenths and stopping at 20 Tenths. Record the numbers on the board as students count aloud.
   $\frac{0}{10}, \frac{1}{10}, \frac{2}{10}, \frac{3}{10}, \ldots \frac{20}{10}$
2. Ask students:

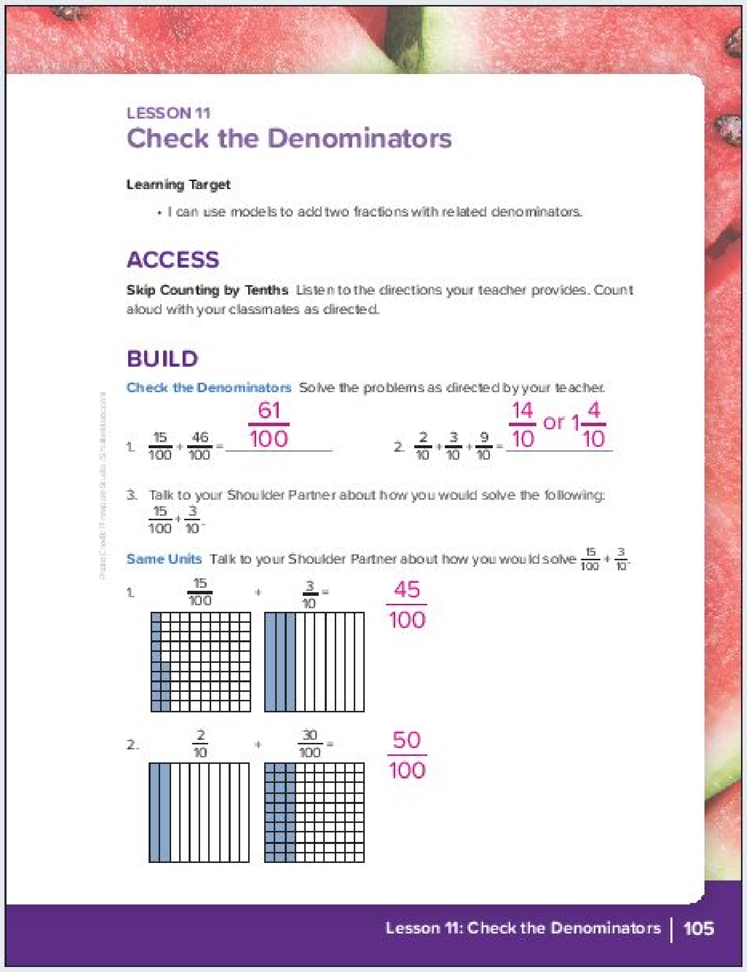
ASK

- *How many Tenths are in one whole?* 10
- *How many Tenths does it take to have 2 wholes?* 20

4. Write 1 under $\frac{10}{10}$ and 2 under $\frac{20}{10}$.
5. Ask students to skip count again by Tenths but when they come to a whole number, say the whole number.
   $\frac{0}{10}, \frac{2}{10}, \ldots\ldots \frac{9}{10}, 1, \frac{11}{10}, \ldots \frac{19}{10}, 2$
6. Point to $\frac{13}{10}$ and $\frac{18}{10}$ and ask students to change the improper fractions to mixed numbers. Record the numbers on the board.
   $1\frac{3}{10}, 1\frac{8}{10}$
7. Ask students to count one more time, but this time alternating between fractions and whole numbers. Record the numbers on the board as students count aloud.
   $\frac{1}{10}, \frac{2}{10} \ldots \frac{9}{10}, 1, 1\frac{1}{10}, 1\frac{2}{10}, 1\frac{3}{10} \ldots 1\frac{9}{10}, 2$
8. If time allows, repeat with Hundredths.

PRINT

Student Page 105



LESSON 11

Check the Denominators

Learning Target

- I can use models to add two fractions with related denominators.

ACCESS

Skip Counting by Tenths Listen to the directions your teacher provides. Count aloud with your classmates as directed.

BUILD

Check the Denominators Solve the problems as directed by your teacher.

1. $\frac{15}{100} + \frac{46}{100} =$ $\frac{61}{100}$
2. $\frac{2}{10} + \frac{3}{10} + \frac{9}{10} =$ $\frac{14}{10}$ or $1\frac{4}{10}$
3. Talk to your Shoulder Partner about how you would solve the following: $\frac{15}{100} + \frac{3}{10}$.

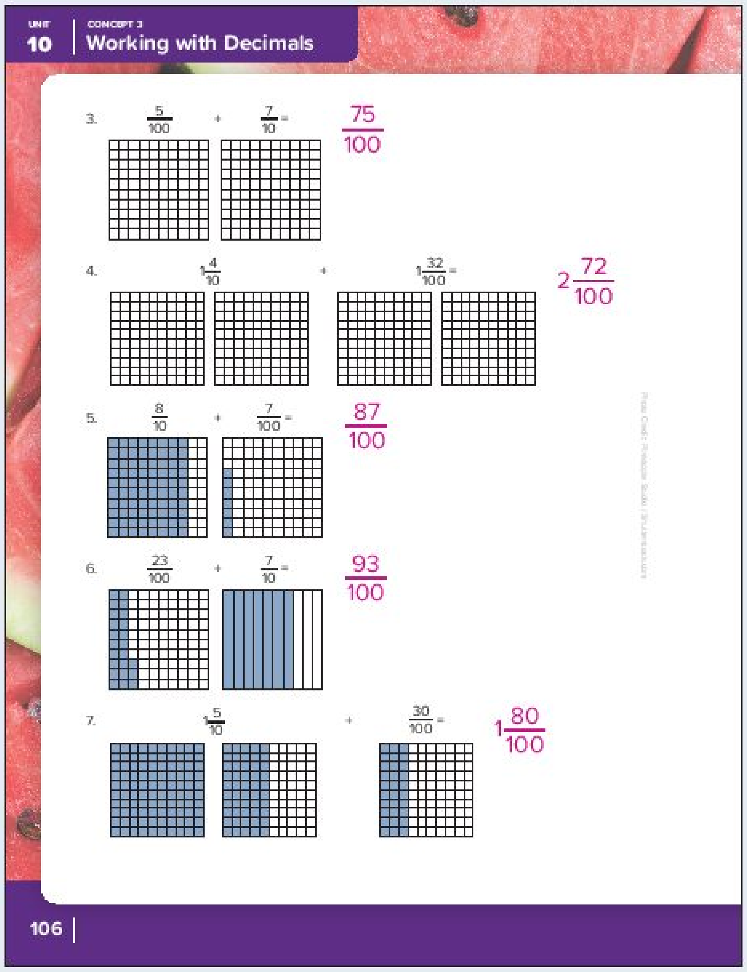
Same Units Talk to your Shoulder Partner about how you would solve $\frac{15}{100} + \frac{3}{10}$.

1. $\frac{15}{100} + \frac{3}{10} =$ $\frac{45}{100}$
2. $\frac{2}{10} + \frac{30}{100} =$ $\frac{50}{100}$

Lesson 11: Check the Denominators | 105

PRINT

Student Page 106


UNIT 10 | CONCEPT 3 Working with Decimals

3. $\frac{5}{100}$ + $\frac{7}{10}$ = $\frac{75}{100}$

4. $1\frac{4}{10}$ + $1\frac{32}{100}$ = $2\frac{72}{100}$

5. $\frac{8}{10}$ + $\frac{7}{100}$ = $\frac{87}{100}$

6. $\frac{23}{100}$ + $\frac{7}{10}$ = $\frac{93}{100}$

7. $1\frac{5}{10}$ + $\frac{30}{100}$ = $1\frac{80}{100}$

106

BUILD (40 min)

Check the Denominators (10 min)

1. Direct students to Lesson 11 BUILD Check the Denominators and chorally read the Learning Targets.
2. Ask students to solve Problems 1 and 2. After a minute, go over the answers with students. Ask students to share their strategies for solving the problems.
3. Remind students that $\frac{2}{10}$ is not 2 numbers. It represents one quantity and that is why when adding $\frac{2}{10} + \frac{3}{10} + \frac{9}{10}$ the sum is not $\frac{14}{30}$.
4. Ask students to look at Problem 3 and think about how they would solve it. Ask students to share their thinking with their Shoulder Partner.
5. Ask students to share their thinking. If students do not recognize that they cannot add the fractions because they do not have the same denominators, explain and discuss. In order to solve the problem, we must make sure the addends have the same denominators. Tell students they will be learning how to do that today.

Answer Key for Check the Denominators:

1. $\frac{61}{100}$
2. $\frac{14}{10}$ or $1\frac{4}{10}$
3. Student discussions will vary.

Same Units (30 minutes)

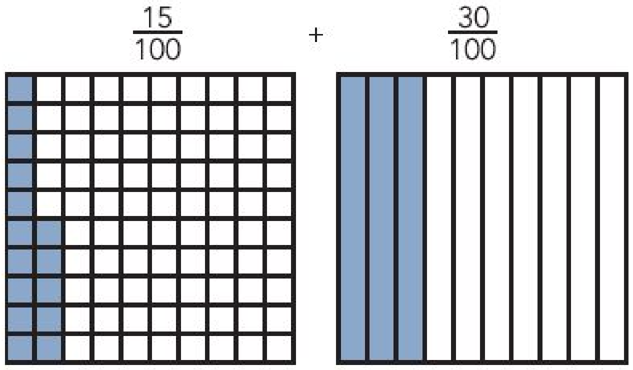
1. Direct students to Lesson 11 BUILD Same Units. Write Problem 1 on the board: $\frac{15}{100} + \frac{3}{10}$.
2. Ask students to look at the models below each fraction and ask the following:

ASK

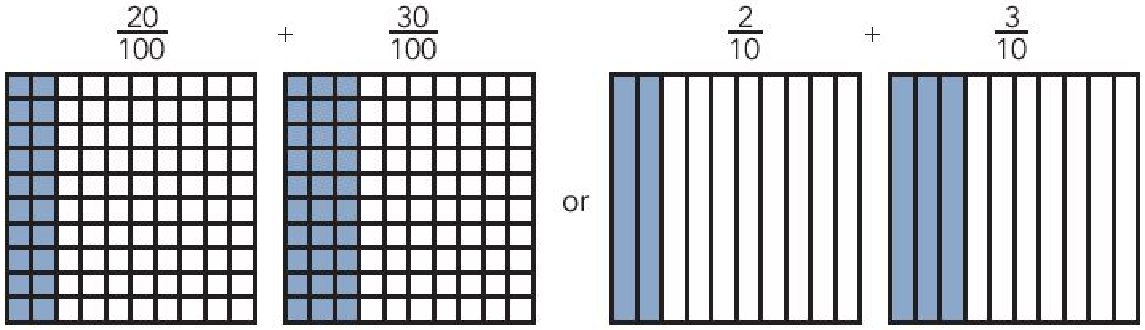
- *How many Hundredths are there in $\frac{3}{10}$?* *30 Hundredths*
- *Could we find a way to make both fractions have the same denominators?* *Students may recognize that they can change $\frac{3}{10}$ to $\frac{30}{100}$.*

3. Tell students that mathematicians call changing both fractions to have the same denominator finding a common denominator. Both fractions can now be added because they have the same denominator.

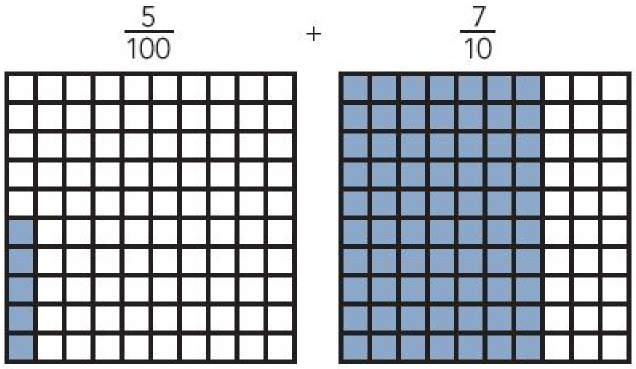
4. As a group, rewrite the problem with common denominators and model this on the board as shown.



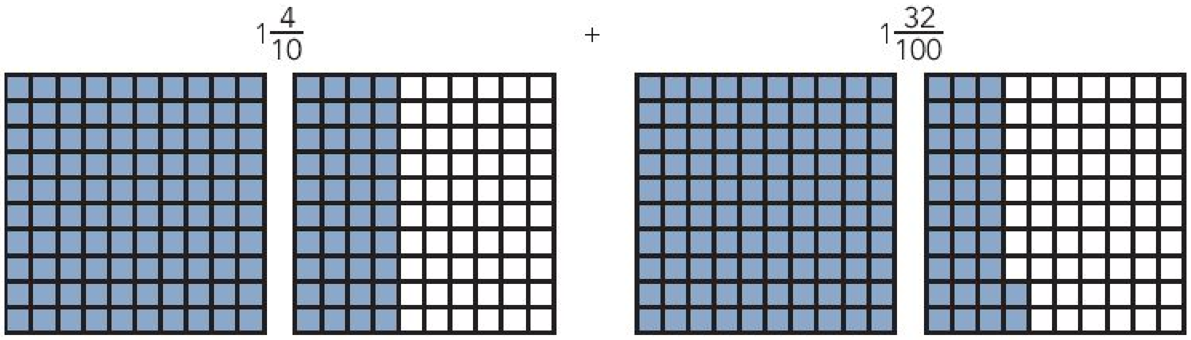
5. Repeat the process with Problem 2. Use the models and students' knowledge of the relationships between Tenths and Hundredths to identify a common denominator. In this case, students might choose to use Tenths or Hundredths as the common denominator (as shown).



6. Repeat with Problem 3. Ask students to color in the models to represent each fraction and then rewrite the problem with common denominators. Point out that both grid models are Hundredths, so they have to think about how to represent $\frac{7}{10}$ on that model.



7. Repeat with $1\frac{4}{10} + 1\frac{32}{100}$, again asking students to first color the model and then think about a common denominator (Hundredths). Then, ask them to rewrite the problem and add the two mixed numbers together.



8. Have students complete the rest of the problems independently, with a partner, or in a small group with the teacher, depending on the needs of the students. The first three have the models colored in for the students, but they need to rewrite the equation with common denominators in the space provided.

9. Review the answers as a group. Model on the board any that were challenging.

Answer Key for Same Units:

1. $\frac{15}{100} + \frac{30}{100} = \frac{45}{100}$
2. $\frac{20}{100} + \frac{30}{100} = \frac{50}{100}$ or $\frac{2}{10} + \frac{3}{10} = \frac{5}{10}$
3. $\frac{5}{100} + \frac{70}{100} = \frac{75}{100}$
4. $1\frac{40}{100} + 1\frac{32}{100} = 2\frac{72}{100}$
5. $\frac{80}{100} + \frac{7}{100} = \frac{87}{100}$
6. $\frac{23}{100} + \frac{70}{100} = \frac{93}{100}$
7. $1\frac{5}{10} + \frac{3}{10}$ or $1\frac{50}{100} + \frac{30}{100} = 1\frac{8}{10}$ or $1\frac{80}{100}$
8. Abeer had $\frac{80}{100} + \frac{25}{100} = \frac{105}{100}$ or $1\frac{5}{100}$ meters of fabric
9. Yes, Diaa has more than a liter; $\frac{50}{100} + \frac{65}{100} = \frac{115}{100}$ or $1\frac{15}{100}$

CONNECT (7 min)

Writing About Math

Ask students to turn to Lesson 11 CONNECT Writing About Math and respond to the prompt.

Answer Key for Writing About Math:
Students should recognize that, because fractions and decimals are related, fraction models can help them build understanding of decimals to the Tenths and Hundredths places.

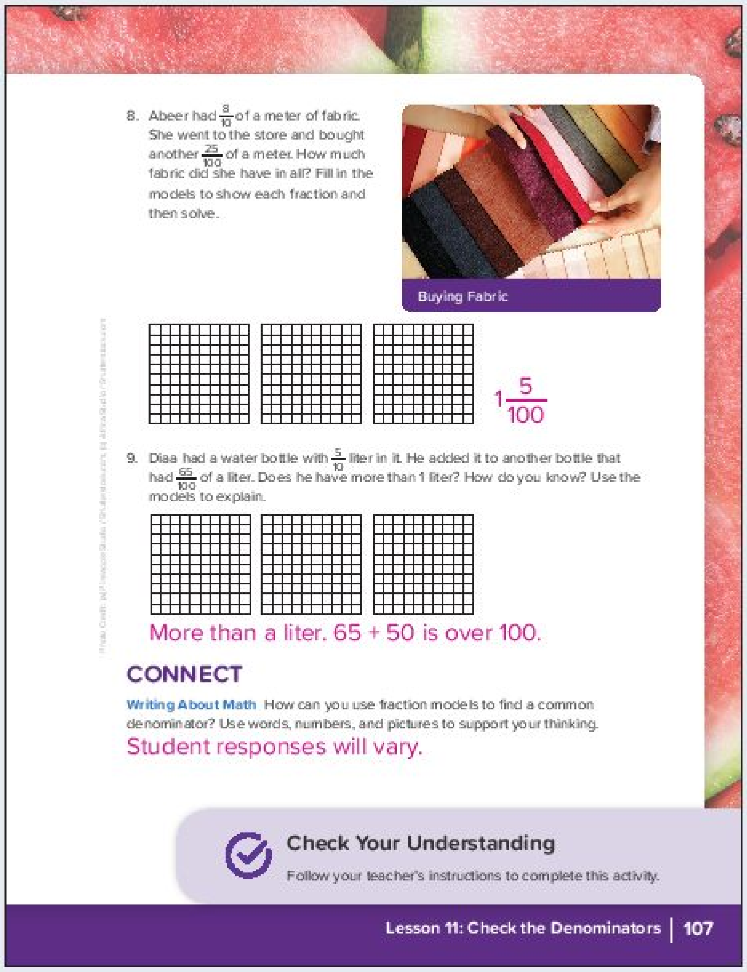
WRAP-UP (3 min)

Let's Chat About Our Learning

Use Calling Sticks to choose students to share their Writing About Math responses. Encourage students to model their thinking on the board.

PRINT

Student Page 107



8. Abeer had $\frac{8}{10}$ of a meter of fabric. She went to the store and bought another $\frac{25}{100}$ of a meter. How much fabric did she have in all? Fill in the models to show each fraction and then solve.

$1\frac{5}{100}$

9. Diaa had a water bottle with $\frac{5}{10}$ liter in it. He added it to another bottle that had $\frac{65}{100}$ of a liter. Does he have more than 1 liter? How do you know? Use the models to explain.

More than a liter. 65 + 50 is over 100.

CONNECT

Writing About Math How can you use fraction models to find a common denominator? Use words, numbers, and pictures to support your thinking.

Student responses will vary.

Check Your Understanding

Follow your teacher's instructions to complete this activity.

Lesson 11: Check the Denominators | 107

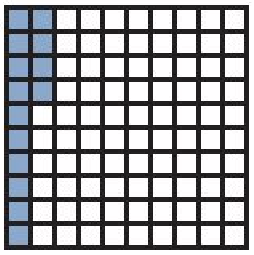
PRACTICE

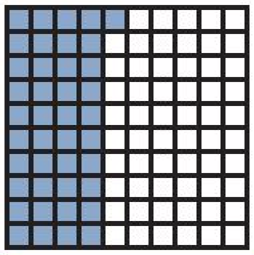
Direct students to Lesson 11 PRACTICE and have them complete the problems. Address student errors and misconceptions related to using models to add two fractions with related denominators.

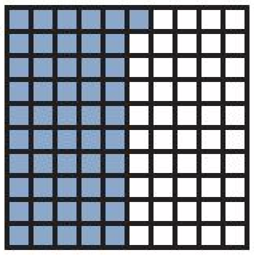
Check Your Understanding

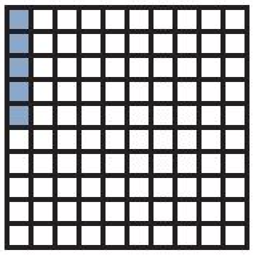
Solve the fraction addition problems and then circle the model that represents the sum.

1. $\frac{1}{100} + \frac{4}{10} = \frac{41}{100}$

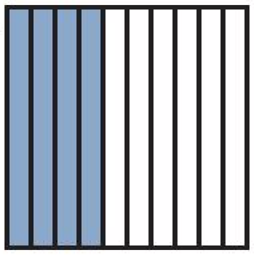
A.


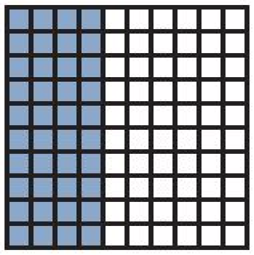
[✓ B.]


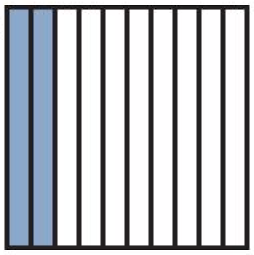
C.


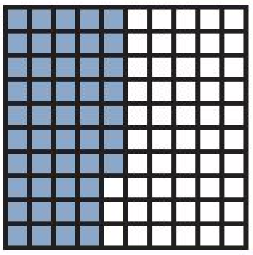
D.


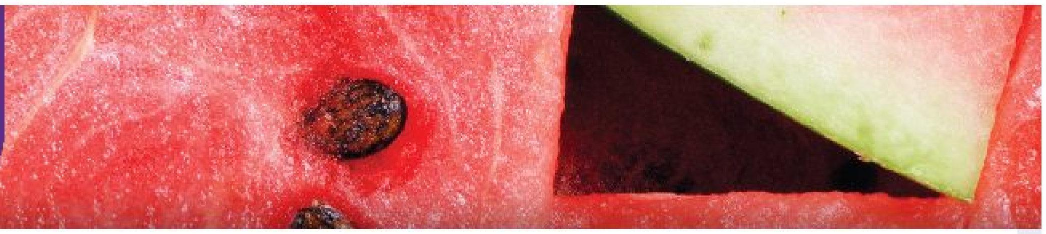
2. $\frac{17}{100} + \frac{3}{10} = \frac{47}{100}$

A.


B.


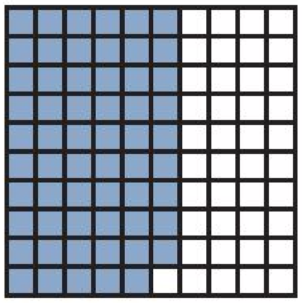
C.


[✓ D.]




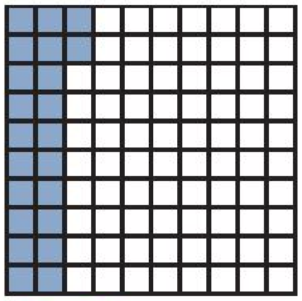
Circle the expression that has a sum that is shown in the model.

3.



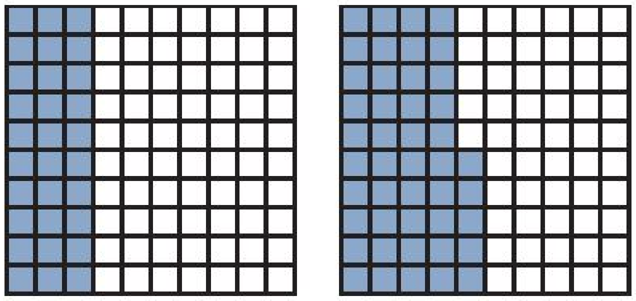
$\frac{2}{10} + \frac{40}{100}$ [✓ $\frac{5}{10} + \frac{9}{100}$] $\frac{90}{100} + \frac{5}{10}$

4.



[✓ $\frac{2}{10} + \frac{2}{100}$] $\frac{20}{100} + \frac{2}{10}$ $\frac{2}{10} + \frac{1}{100}$

5. Fatma poured $\frac{3}{10}$ liter of water into a jar that already had $\frac{45}{100}$ liter. How much water is now in the jar? Use the models to help.



$= \frac{75}{100}$ L of water

LESSON 12
Putting the Pieces Together

Lesson Overview

In this lesson, students add fractions with related denominators to solve bare number problems and story problems. They find equivalent fractions and rewrite the problem with common denominators.

Essential Question

- What strategies can I use to add fractions with related denominators?

Learning Objective

In this lesson

- Students will add two fractions with related denominators.

Grade-Level Standard

4.B.3.a Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100 (for example express $\frac{2}{10}$ as $\frac{20}{100}$ and add $\frac{2}{10} + \frac{5}{100} = \frac{25}{100}$).

Vocabulary Check-In

equivalence, equivalent

Materials List

- Optional: Hundredths Grid Models
- Optional: Tenths Grid Models
- Unit 10 Lesson 12 Fraction Addition Battle Cards

Photo Credit: Pineapple Studio / Shutterstock.com

DIGITAL

Lesson 12

Putting the Pieces Together

Quick Code: egmt4153

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may add the numerators and denominators separately when adding fractions with unlike denominators (for example, $\frac{3}{10} + \frac{40}{100} \neq \frac{43}{110}$).

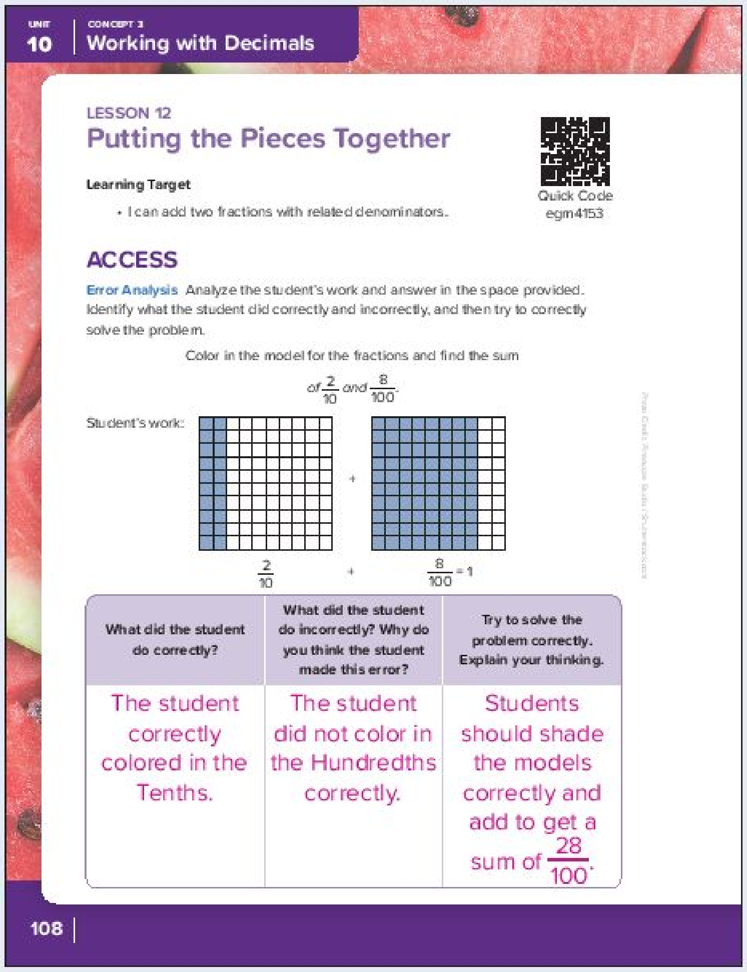
Error Analysis

1. Ask students to turn to Lesson 12 ACCESS Error Analysis and complete the error analysis problem.
2. After a few minutes, go over the answer together.

Answer Key for Error Analysis:
The student colored in the Tenths correctly but not the Hundredths, so they believed that the sum was 1.

PRINT

Student Page 108



UNIT 10 | CONCEPT 3 Working with Decimals

LESSON 12

Putting the Pieces Together

Learning Target

- I can add two fractions with related denominators.

Quick Code
egm4153

ACCESS

Error Analysis Analyze the student's work and answer in the space provided. Identify what the student did correctly and incorrectly, and then try to correctly solve the problem.

Color in the model for the fractions and find the sum of $\frac{2}{10}$ and $\frac{8}{100}$.

Student's work:

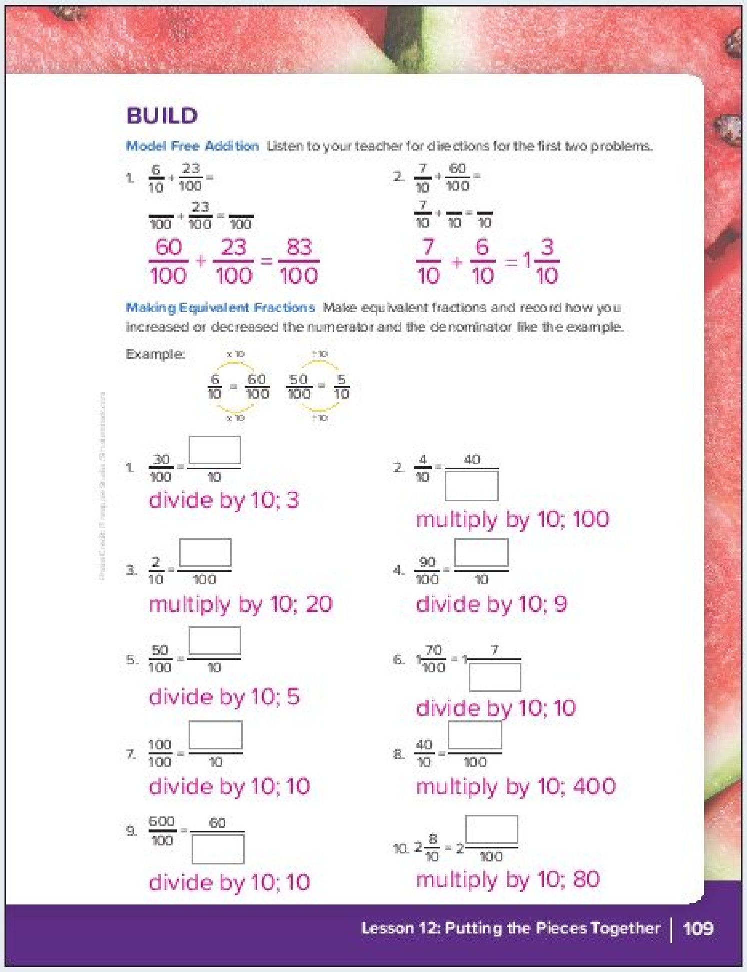
$\frac{2}{10} + \frac{8}{100} = 1$

What did the student do correctly?	What did the student do incorrectly? Why do you think the student made this error?	Try to solve the problem correctly. Explain your thinking.
The student correctly colored in the Tenths.	The student did not color in the Hundredths correctly.	Students should shade the models correctly and add to get a sum of $\frac{28}{100}$.

108

PRINT

Student Page 109



BUILD

Model Free Addition Listen to your teacher for directions for the first two problems.

1. $\frac{6}{10} + \frac{23}{100} =$

$\frac{\_\_}{100} + \frac{23}{100} = \frac{\_\_}{100}$

$\frac{60}{100} + \frac{23}{100} = \frac{83}{100}$

2. $\frac{7}{10} + \frac{60}{100} =$

$\frac{7}{10} + \frac{\_\_}{10} = \frac{\_\_}{10}$

$\frac{7}{10} + \frac{6}{10} = 1\frac{3}{10}$

Making Equivalent Fractions Make equivalent fractions and record how you increased or decreased the numerator and the denominator like the example.

Example: $\frac{6}{10} \overset{\times 10}{=} \frac{60}{100}$ $\frac{50}{100} \overset{\div 10}{=} \frac{5}{10}$

1. $\frac{30}{100} = \frac{\square}{10}$ divide by 10; 3
2. $\frac{4}{10} = \frac{40}{\square}$ multiply by 10; 100
3. $\frac{2}{10} = \frac{\square}{100}$ multiply by 10; 20
4. $\frac{90}{100} = \frac{\square}{10}$ divide by 10; 9
5. $\frac{50}{100} = \frac{\square}{10}$ divide by 10; 5
6. $1\frac{70}{100} = 1\frac{7}{\square}$ divide by 10; 10
7. $\frac{100}{100} = \frac{\square}{10}$ divide by 10; 10
8. $\frac{40}{10} = \frac{\square}{100}$ multiply by 10; 400
9. $\frac{600}{100} = \frac{60}{\square}$ divide by 10; 10
10. $2\frac{8}{10} = 2\frac{\square}{100}$ multiply by 10; 80

Lesson 12: Putting the Pieces Together | 109

BUILD (40 min)

Model Free Addition (10 min)

1. Review with students how to add two fractions with related denominators. Ask students to explain why we need to have the same units or common denominators to add fractions.
   If the fractions do not have common denominators, it is not possible to identify what the denominator in the answer should be.
2. Direct students to Lesson 12 BUILD Model Free Addition and look at Problem 1 together. Ask students to identify how many Hundredths are equivalent to $\frac{6}{10}$? 60
3. Ask students to record $\frac{60}{100}$ and solve the problem.
4. Repeat with the second problem, asking students to first find an equivalent fraction for $\frac{60}{100}$ and then solve.
5. Discuss the following questions:

ASK

- *In the first problem, why were both fractions converted into Hundredths?*
  We could not convert them into Tenths because $\frac{23}{100}$ cannot convert to Tenths.
- *Could the fractions have been converted to anything else?*
  No
- *In the second problem, why were both fractions converted to Tenths?*
  $\frac{60}{100}$ can convert easily to Tenths.
- *Could the fractions have been converted to anything else?*
  Yes. They could be converted to Hundredths or mixed numbers. $\frac{13}{10}$ can be rewritten as $1\frac{3}{10}$.

6. Remind students that when we add two fractions with unlike denominators, we must find a common denominator first.

Answer Key for Model Free Addition:

1. $\frac{83}{100}$
2. $\frac{13}{10}$ or $1\frac{3}{10}$

Making Equivalent Fractions (15 min)

TEACHER NOTE: When splitting the group for these activities, it might help to have students that are not as confident do the Making Equivalent Fraction activity first and the students with a stronger grasp start with the game Fraction Addition Battle. This will give the less confident students time to practice making equivalent fractions.

1. Divide the class into two groups.
2. Explain that one group will complete Lesson 12 BUILD Making Equivalent Fractions independently while the second group learns and plays a game. Tell students that after about 12 minutes they will switch to the other activity.
3. Direct the first group to Lesson 12 BUILD Making Equivalent Fractions to begin.

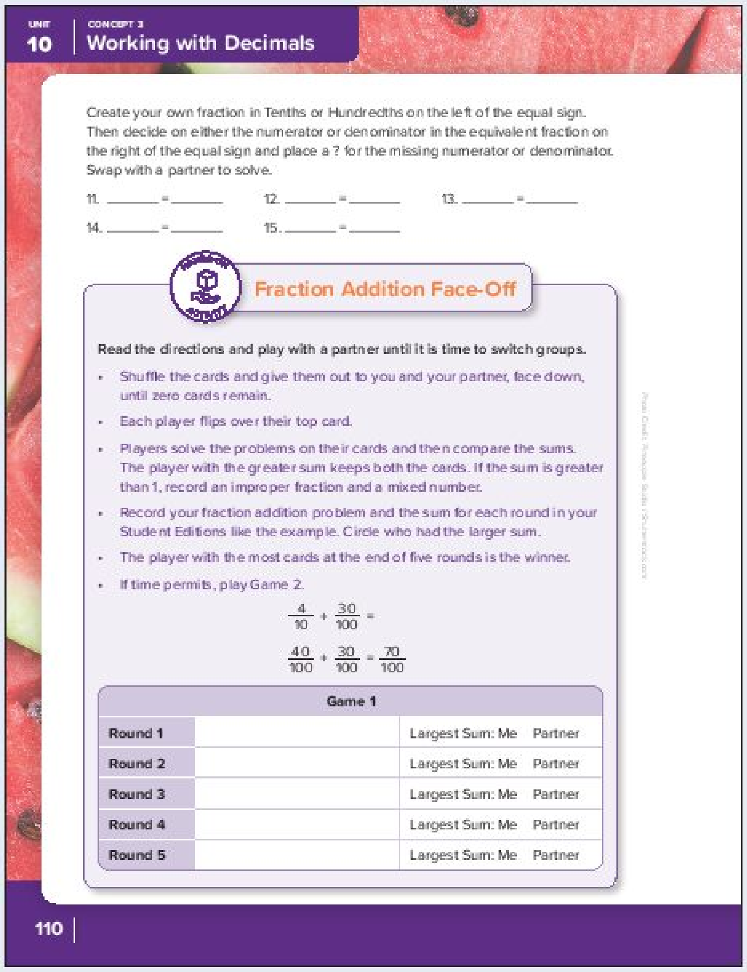
Answer Key for Making Equivalent Fractions:

1. $\frac{30}{100} = \frac{3}{10}$; divide by 10
2. $\frac{4}{10} = \frac{40}{100}$; multiply by 10
3. $\frac{2}{10} = \frac{20}{100}$; multiply by 10
4. $\frac{90}{100} = \frac{9}{10}$; divide by 10
5. $\frac{50}{100} = \frac{5}{10}$; divide by 10
6. $1\frac{70}{100} = 1\frac{7}{10}$; divide by 10
7. $\frac{100}{100} = \frac{10}{10}$; divide by 10
8. $\frac{40}{10} = \frac{400}{100}$; multiply by 10
9. $\frac{600}{100} = \frac{60}{10}$; divide by 10
10. $2\frac{8}{10} = 2\frac{80}{100}$; multiply by 10

11–15. Answers will vary.

PRINT

Student Page 110



UNIT 10 | CONCEPT 3 Working with Decimals

Create your own fraction in Tenths or Hundredths on the left of the equal sign. Then decide on either the numerator or denominator in the equivalent fraction on the right of the equal sign and place a ? for the missing numerator or denominator. Swap with a partner to solve.

11. ______ = ______
12. ______ = ______
13. ______ = ______
14. ______ = ______
15. ______ = ______

Fraction Addition Face-Off

Read the directions and play with a partner until it is time to switch groups.

- Shuffle the cards and give them out to you and your partner, face down, until zero cards remain.
- Each player flips over their top card.
- Players solve the problems on their cards and then compare the sums. The player with the greater sum keeps both the cards. If the sum is greater than 1, record an improper fraction and a mixed number.
- Record your fraction addition problem and the sum for each round in your Student Editions like the example. Circle who had the larger sum.
- The player with the most cards at the end of five rounds is the winner.
- If time permits, play Game 2.

$$\frac{4}{10} + \frac{30}{100} =$$

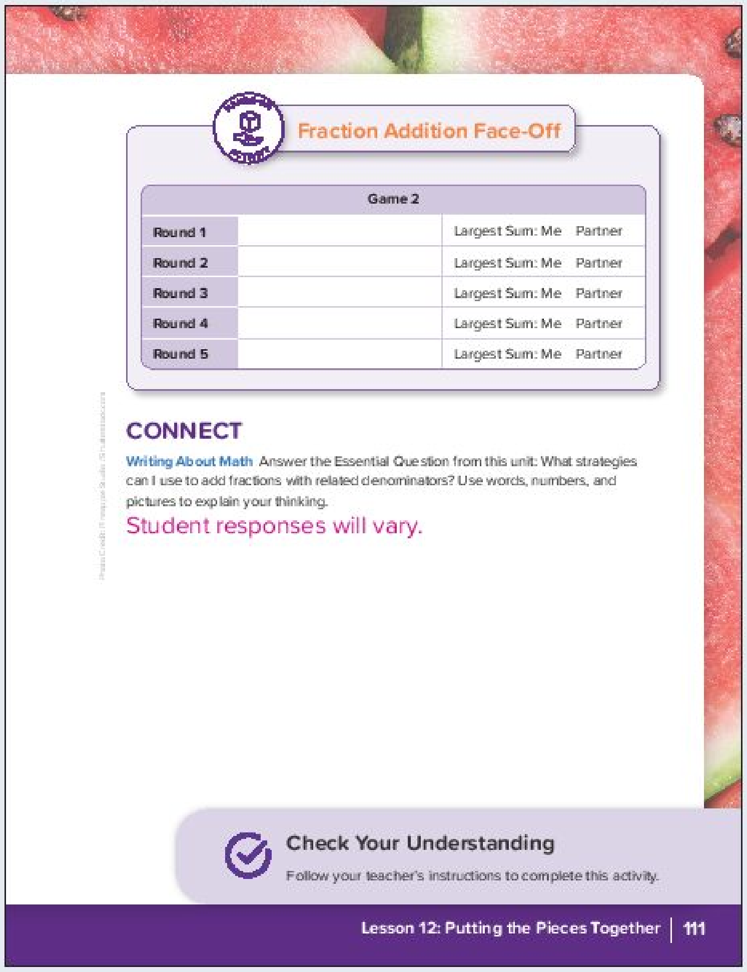
$$\frac{40}{100} + \frac{30}{100} = \frac{70}{100}$$

Game 1		
Round 1		Largest Sum: Me Partner
Round 2		Largest Sum: Me Partner
Round 3		Largest Sum: Me Partner
Round 4		Largest Sum: Me Partner
Round 5		Largest Sum: Me Partner

110

PRINT

Student Page 111



Fraction Addition Face-Off

Game 2		
Round 1		Largest Sum: Me Partner
Round 2		Largest Sum: Me Partner
Round 3		Largest Sum: Me Partner
Round 4		Largest Sum: Me Partner
Round 5		Largest Sum: Me Partner

CONNECT

Writing About Math Answer the Essential Question from this unit: What strategies can I use to add fractions with related denominators? Use words, numbers, and pictures to explain your thinking.

Student responses will vary.

Check Your Understanding

Follow your teacher's instructions to complete this activity.

Lesson 12: Putting the Pieces Together | 111

Fraction Addition Face-Off (15 min)

1. Gather the other half of the class and distribute a set of Fraction Addition Face-Off cards to each pair.
2. Explain that this game is similar to the one they played in Lesson 8, but the cards have a fraction addition problem on them.
3. Review the directions:
    - Shuffle the cards and give them out to you and your partner, face down, until zero cards remain.
    - Each player flips over their top card.
    - Players solve the problems on their cards and then compare the sums. The player with the greater sum keeps both the cards. If the sum is greater than 1, record an improper fraction and a mixed number.
    - Record your fraction addition problem and the sum for each round in your Student Materials like the example. Circle who had the larger sum.
    - The player with the most cards at the end of five rounds is the winner.
    - If time permits, play Game 2.
4. After about 12 minutes, switch the groups.

Answer Key for Fraction Addition Face-Off:
Answers will vary based on cards chosen by players. Check Student Materials for accuracy.

CONNECT (7 min)

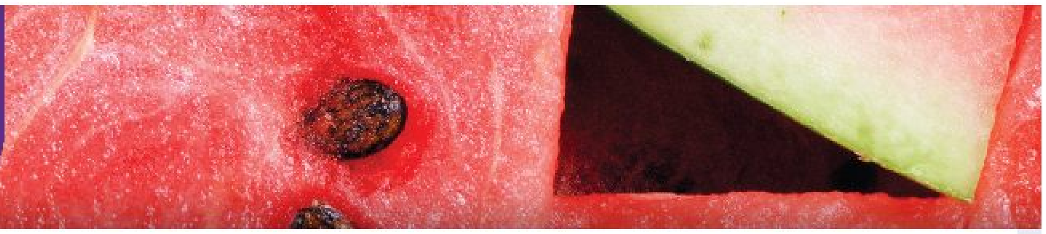
Writing About Math

Ask students to turn to Lesson 12 CONNECT Writing About Math and respond to the prompt.

WRAP-UP (3 min)

Let's Chat About Our Learning

Use Calling Sticks to choose students to share their Writing About Math response with the class. Allow students to model their thinking on the board.



PRACTICE

Direct students to Lesson 12 PRACTICE and have them complete the problems. Address student errors and misconceptions related to adding two fractions with related denominators.

Check Your Understanding

Solve the following problems.

1. $\frac{50}{100} + \frac{4}{10} = \frac{90}{100}$ or $\frac{9}{10}$
2. $\frac{45}{100} + \frac{7}{10} = \frac{115}{100}$ or $1\frac{15}{100}$
3. $1\frac{2}{10} + 1\frac{34}{100} = 2\frac{54}{100}$
4. Laila was reading a book over the weekend. She read $\frac{3}{10}$ of the book on Friday and $\frac{65}{100}$ of the book on Saturday. What fraction of the book did she read in all?

   $\frac{95}{100}$ of the book.
5. Ziad had a liter pitcher that was $\frac{2}{10}$ of the way full. He added another $\frac{60}{100}$ of a liter to the pitcher. What fraction of the pitcher does he have left to fill? In Tenths? In Hundredths?

   $\frac{20}{100} + \frac{60}{100} = \frac{80}{100}$; $\frac{100}{100} - \frac{80}{100} = \frac{20}{100}$ or $\frac{2}{10}$ of the pitcher still needs to be filled.

Concept Check-In and Remediation

Lesson Overview

In this lesson, students work to correct misconceptions and errors from Concept 3: Working with Decimals. First, administer the Concept Check-In. Once you have reviewed the quiz results, choose remediation activities based on the needs of your students. Some recommendations are listed in the chart, but the needs of your particular students should inform your choices. Students may work independently, in pairs, or in a small group with the teacher.

Concept Essential Questions

- How is determining the value of decimals and whole numbers similar and different?
- What strategies can I use to add fractions with related denominators like Tenths and Hundredths?

Learning Objective

In this lesson

- Students will work to correct misconceptions and errors related to comparing decimals and fractions.

Grade-Level Standards

4.B.3.a Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100 (for example express $\frac{2}{10}$ as $\frac{20}{100}$ and add $\frac{2}{10} + \frac{5}{100} = \frac{25}{100}$).

4.B.3.b Use decimal notation for fractions with denominators 10 or 100 (for example, write $\frac{62}{100}$ as .62).

4.B.3.c Compare two decimals to the Hundredths place.

4.B.3.d Demonstrate understanding that decimal comparisons are valid only when the two decimals refer to the same whole.

4.B.3.e Record the results of decimal comparisons using the symbols >, <, =.

Materials List

- Materials may vary

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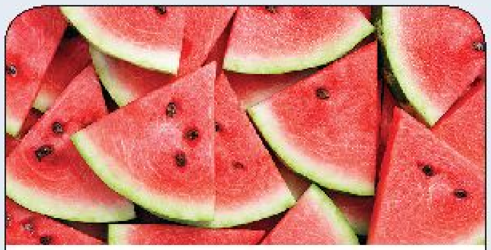
DIGITAL



Concept Check-In and Remediation

Quick Code:
egmt4154

Vocabulary Check-In

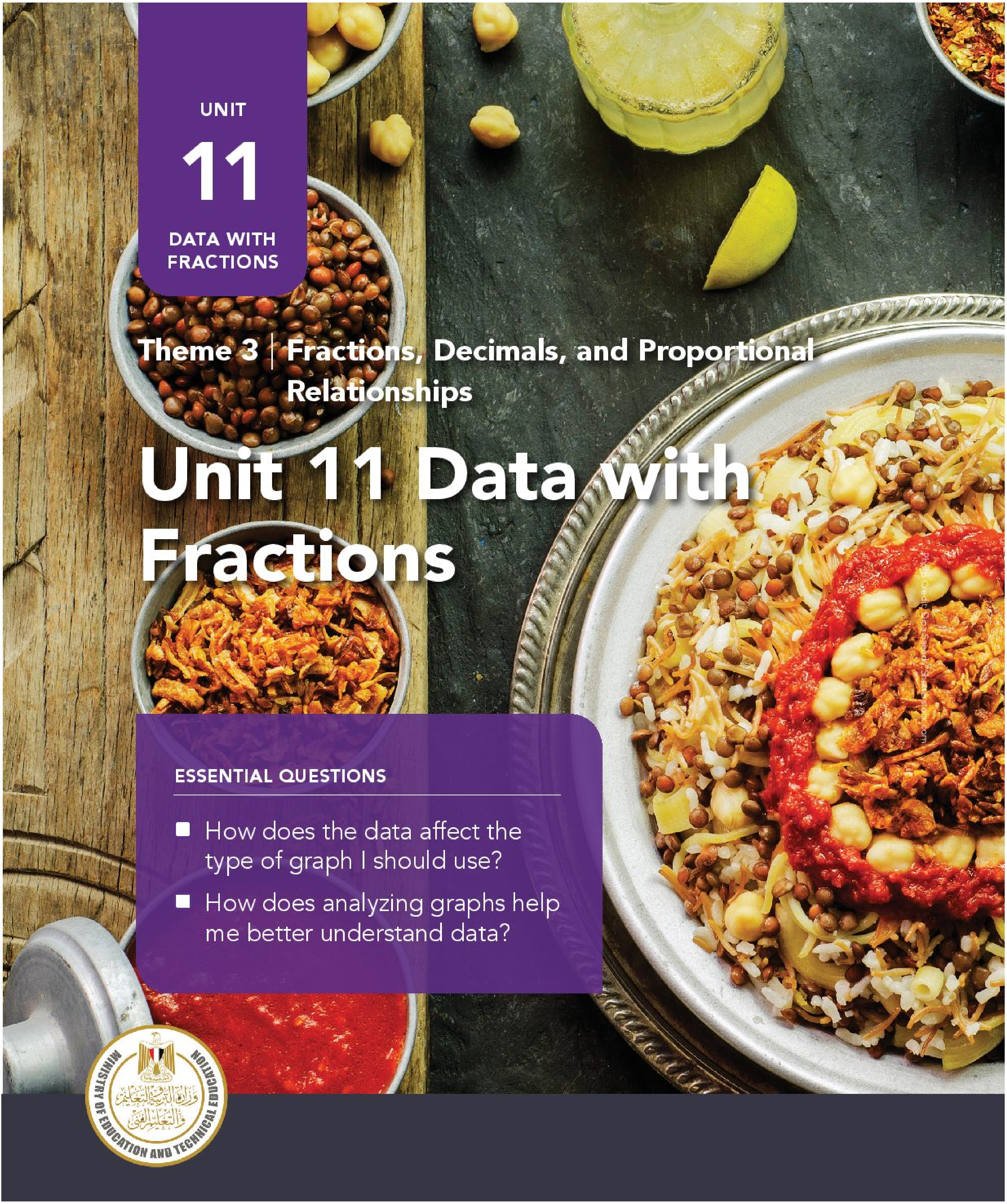
Review concept vocabulary as needed.

COMMON MISCONCEPTIONS AND ERRORS

- Students may think that decimals with more digits have a greater value without looking at the units.
- Students may struggle to rewrite fractions and decimals into matching forms before they compare.
- Students may struggle to see the equivalence between Tenths and Hundredths and move between the two models.
- Students may add the numerators and denominators separately when adding fractions with unlike denominators (for example, $\frac{3}{10}+\frac{40}{100}\neq\frac{43}{110}$).

Remediation: Correcting Misconceptions

If... Students think that decimals with more digits have a greater value without looking at the units.	**Then...** Review Lesson 8 BUILD and practice writing decimals with different numbers of digits into a place value chart and practice comparing them.
If... Students struggle to rewrite fractions and decimals into matching forms before they compare.	**Then...** Review Lesson 10 and create similar problems to the BUILD problems. Students can shade visual models to see how to change from a decimal to a fraction and compare the numbers using the model.
If... Students struggle to see the equivalence between Tenths and Hundredths and move between the two models.	**Then...** Review Lesson 11 Same Units and practice finding equivalence with models moving between Tenths and Hundredths. Provide lots of practice coloring in Tenths and changing to Hundredths and vice versa.
If... Students add the numerators and denominators separately when adding fractions with unlike denominators (for example, $\frac{3}{10} + \frac{40}{100} \neq \frac{43}{110}$).	**Then...** Review Lesson 12 Making Equivalent Fractions. Have students solve similar problems but support using models. Play Fraction Addition Battle but with visual models. Explicitly show how $\frac{1}{10} + \frac{30}{100}$ will not equal $\frac{31}{110}$. Have student shade in $\frac{1}{10}$ as $\frac{10}{100}$ and then shade in another $\frac{30}{100}$ on the same grid to see that when we add the two, the denominator stays 100 not 110. Model how to have 110 squares it would take two grids. Remind them of the work they did in Unit 9. $\frac{1}{4} + \frac{1}{4}$ does not equal $\frac{2}{8}$. Provide lots of work with visual models to see the equivalence as well practice adding and subtracting.



UNIT

11

DATA WITH
FRACTIONS

Theme 3 | Fractions, Decimals, and Proportional Relationships

Unit 11 Data with Fractions

ESSENTIAL QUESTIONS

- How does the data affect the type of graph I should use?
- How does analyzing graphs help me better understand data?

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Video Questions

The Unit 11 Opener Video, Plant Life, explores graphs and charts and identifies how graphs display data in meaningful ways. The video uses plant growth to illustrate how to show changes in data over time. Students are challenged to consider what data or information they would like to collect.

- What types of data could you collect and graph?
- Why do you think there are different types of graphs?
- How does data with fractions change the way you create graphs?

Quick Code
egmt4184

Key Vocabulary

As students investigate real-world situations, they will develop an understanding of and be introduced to the following key vocabulary:

axis, bar graph, categories, data, double bar graph, frequency, horizontal, increments, intervals, key, scale, vertical

Quick Code
egmt4185

Data with Fractions

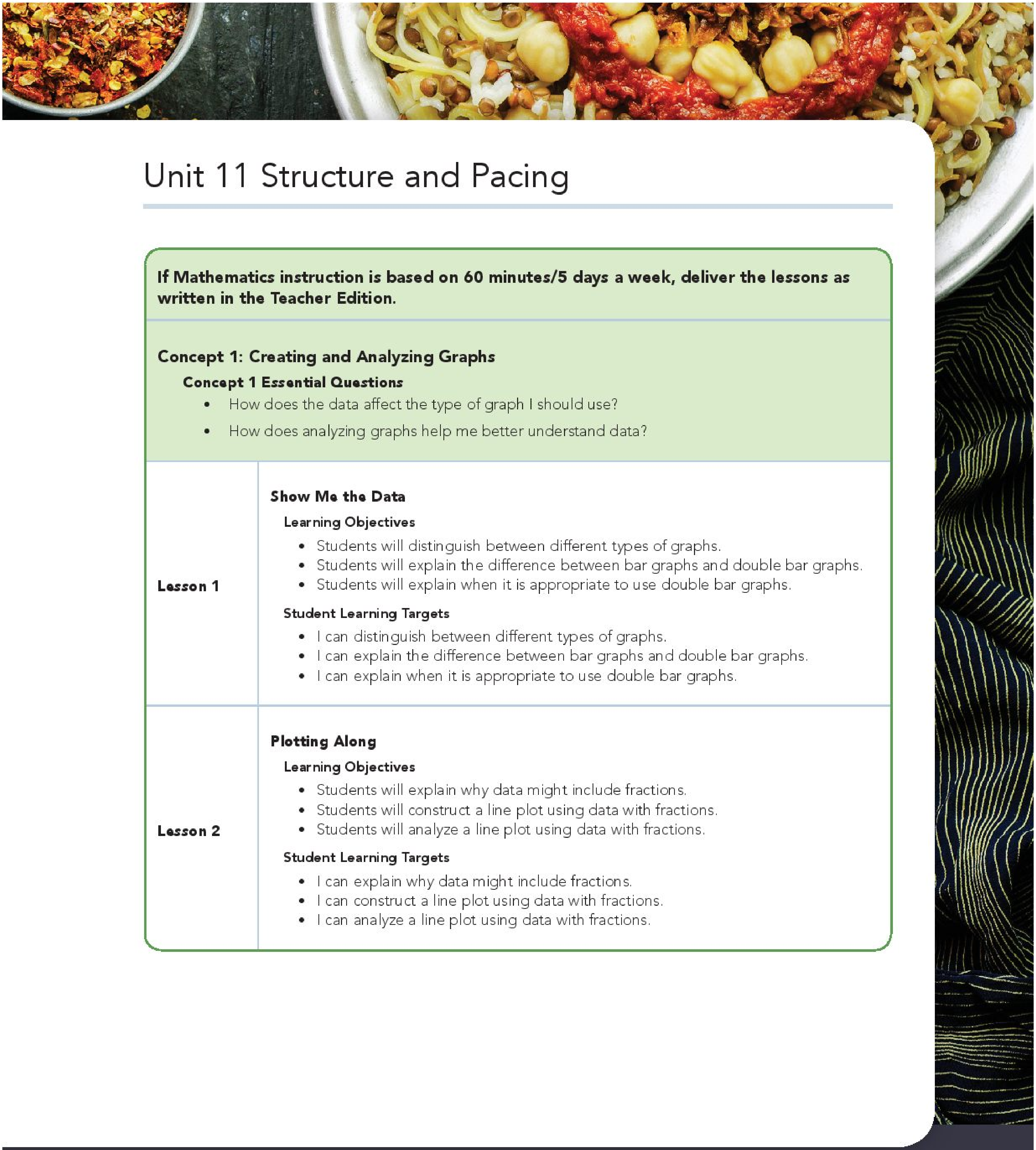
Unit Storyline

Unit 11 Data with Fractions Storyline

The Data with Fractions unit extends students' working knowledge of how to collect, organize, represent, and analyze numerical data on a line plot. Students apply these learnings to story problems to further their understanding and ability to ask and answer questions by analyzing data. Also, students select appropriate graphical representation of data. To support learning, students observe video footage and investigate problems related to food and culture to enhance their understanding of measurement.

Unit Standards

4.D.2	Ask and answer questions by collecting, organizing, and representing appropriate data.
4.D.2.a	Select and make an appropriate graph to display a data set of measurements in fractions of a unit (for example, line plot, bar graph, or double bar graph).
4.D.2.b	Solve problems involving addition and subtraction of fractions by using information presented in graphs (for example, from a line plot find and analyze the difference in height between the tallest and shortest students in the classroom).



Unit 11 Structure and Pacing

If Mathematics instruction is based on 60 minutes/5 days a week, deliver the lessons as written in the Teacher Edition.

Concept 1: Creating and Analyzing Graphs

Concept 1 Essential Questions

- How does the data affect the type of graph I should use?
- How does analyzing graphs help me better understand data?

Lesson 1	**Show Me the Data** **Learning Objectives** • Students will distinguish between different types of graphs. • Students will explain the difference between bar graphs and double bar graphs. • Students will explain when it is appropriate to use double bar graphs. **Student Learning Targets** • I can distinguish between different types of graphs. • I can explain the difference between bar graphs and double bar graphs. • I can explain when it is appropriate to use double bar graphs.
Lesson 2	**Plotting Along** **Learning Objectives** • Students will explain why data might include fractions. • Students will construct a line plot using data with fractions. • Students will analyze a line plot using data with fractions. **Student Learning Targets** • I can explain why data might include fractions. • I can construct a line plot using data with fractions. • I can analyze a line plot using data with fractions.

Unit Structure and Pacing *cont'd*

Lesson 3	**Breaking the Bar** **Learning Objectives** • Students will construct a bar graph using data with fractions. • Students will analyze a bar graph containing data with fractions. • Students will construct a double bar graph using data with fractions. • Students will analyze a double bar graph containing data with fractions. **Student Learning Targets** • I can construct a bar graph using data with fractions. • I can analyze a bar graph containing data with fractions. • I can construct a double bar graph using data with fractions. • I can analyze a double bar graph containing data with fractions.
Lesson 4	**Data About Us** **Learning Objectives** • Students will select the most appropriate graph to display a set of data. • Students will construct an appropriate graph to display a set of data. • Students will analyze data in graphs. **Student Learning Targets** • I can select the most appropriate graph to display a set of data. • I can construct an appropriate graph to display a set of data. • I can analyze data in graphs.
Lesson 5	**Graphing the Class** **Learning Objective** • Students will ask and answer questions about fractional data in a graph. **Student Learning Target** • I can ask and answer questions about fractional data in a graph.

Concept Check-In and Remediation

Learning Objective

- Students will work to correct misconceptions and errors related to creating and analyzing graphs with fraction data.

Student Learning Target

- I can correct misconceptions and errors related to creating and analyzing graphs with fraction data.

Alternate Pacing Guides

If Mathematics instruction is based on 45 minutes/5 days a week, do the following:

Reduce ACCESS by 3 minutes

Reduce BUILD by 8 minutes

Reduce CONNECT by 2 minutes

Reduce WRAP-UP by 2 minutes

Strategies for reducing time in each section:

- Discuss fewer examples
- Eliminate Shoulder Partner conversations
- Shorten class discussions
- Work with students to complete ACCESS problems

If Mathematics instruction is based on a combination of 45 minutes/4 days a week and 90 minutes 1 day a week, do the following:

Follow the 45-minute approach for the 45-minute days.

Teach two 45-minute lessons on the 90-minute day.

If Mathematics instruction is based on 90 minutes/5 days a week, do the following:

Increase ACCESS by 5 minutes

Increase BUILD by 20 minutes

Increase CONNECT by 3 minutes

Increase WRAP-UP by 2 minutes

Strategies for increasing time in each section:

- Discuss additional examples as needed
- Extend class discussions
- Allow time for hands-on work with manipulatives and models
- Provide additional practice problems for students who need additional practice
- Encourage students to share and model their problem-solving strategies

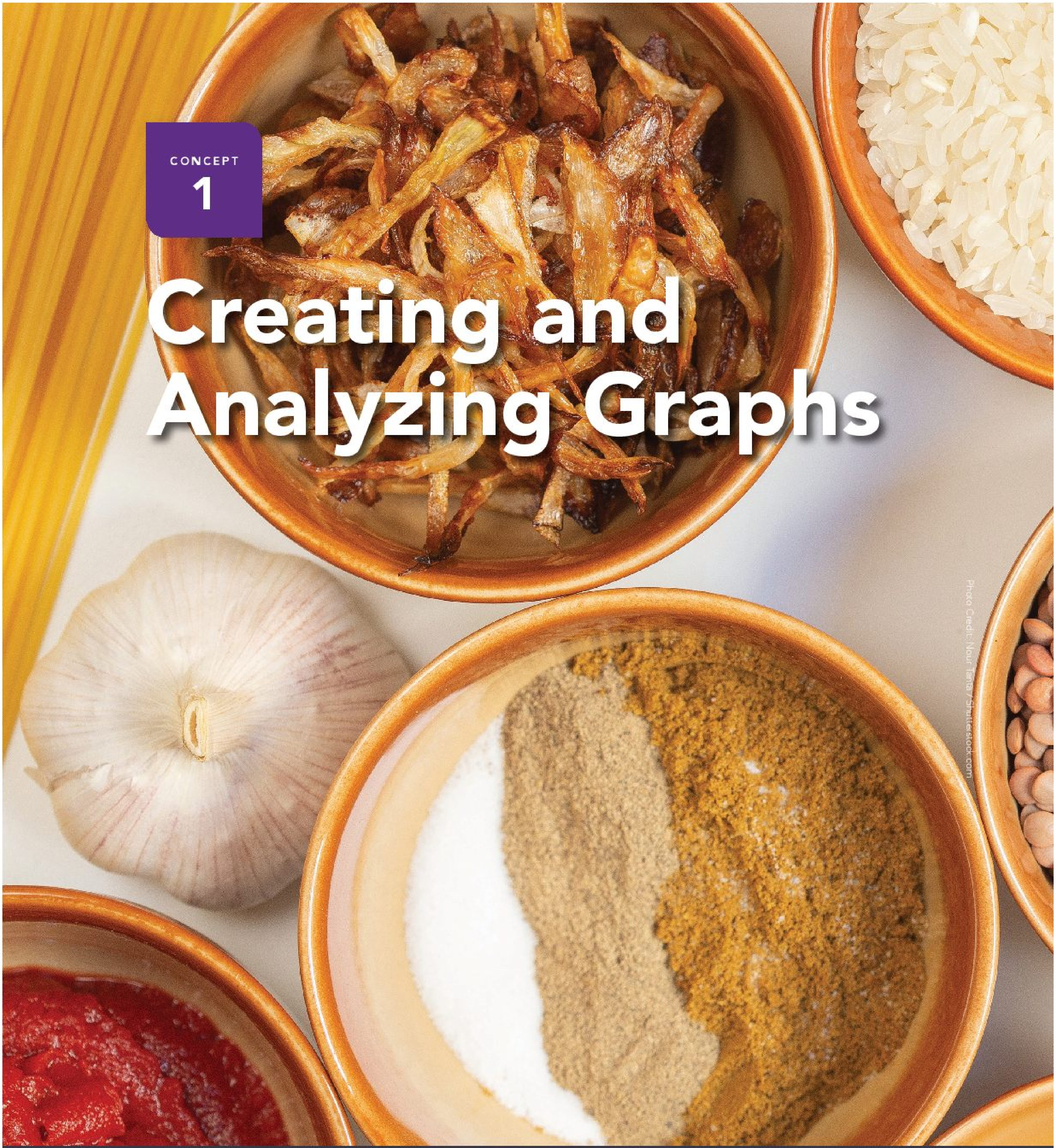
Mathematical Background Knowledge

In Primary 3, students collected, organized, and represented numerical data on a line plot. They analyzed data on a line plot and solved story problems. In Primary 4, students ask and answer questions by collecting, organizing, and representing data. They select line plots, bar graphs, or double bar graphs depending on the collected data. They create graphs, choosing the title, labels, scale, and key. They analyze the data in graphs and ask and answer questions based on that data. Students in Primary 4 are challenged to collect, graph, and analyze data including fractions. In Primary 5, students analyze, interpret, and create pie charts.

CONCEPT

1

Creating and Analyzing Graphs



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Concept Overview

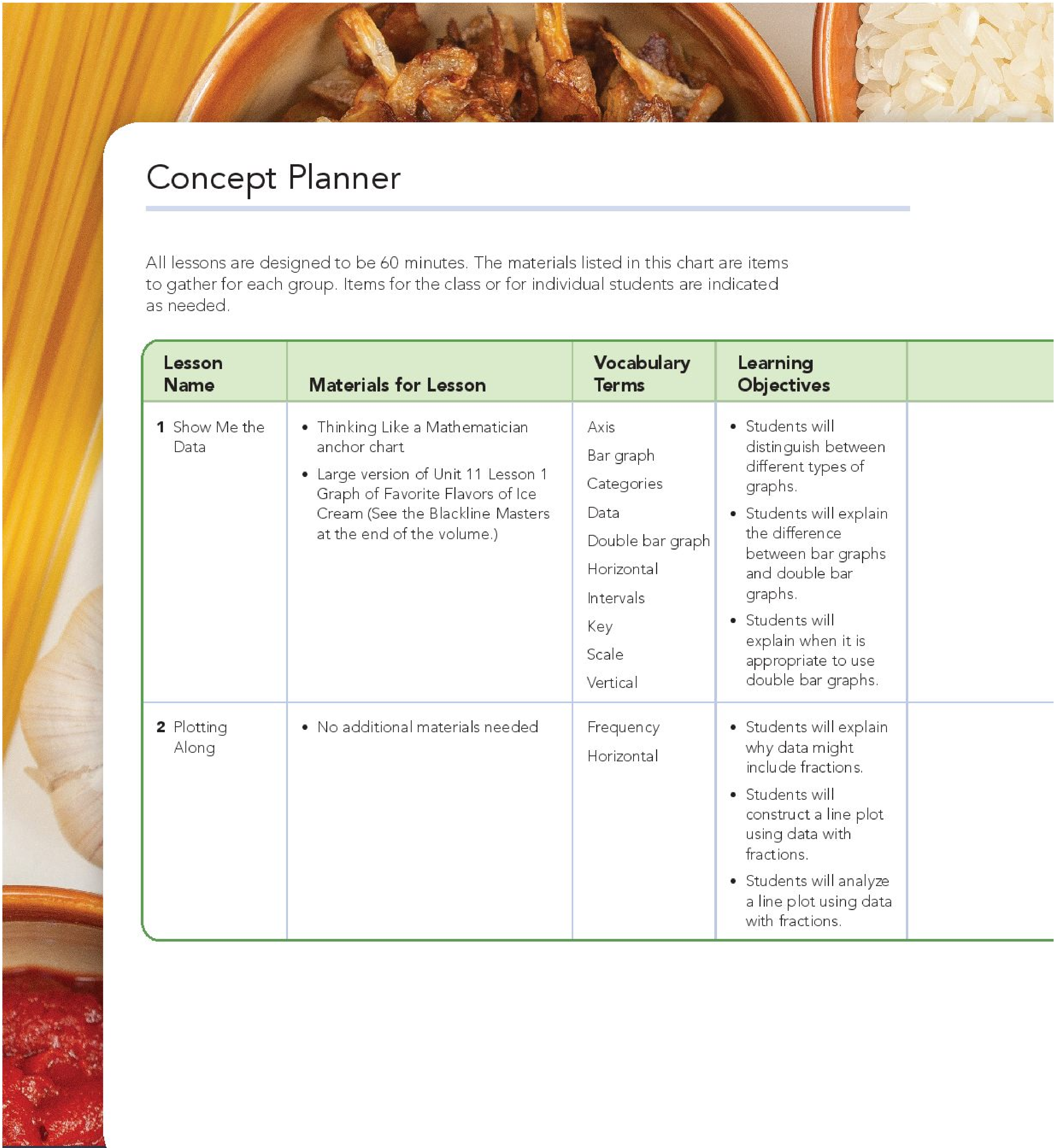
In Concept 1: Creating and Analyzing Graphs, students organize, create, and analyze bar graphs, double bar graphs, and line plots. Bar graphs and line plots are reviewed from previous grades. Students explore double bar graphs and line plots with fractional values. They create graphs from tables and charts, generate and answer questions about various graphs, and determine which graph is appropriate for different data sets. The concept wraps up with students collecting data from their peers and determining how to represent the data in a graph. They write questions about their own graphs and answer questions posed by partners about their graphs.

Concept Standards

4.D.2 Ask and answer questions by collecting, organizing, and representing appropriate data.

4.D.2.a Select and make an appropriate graph to display a data set of measurements in fractions of a unit (for example, line plot, bar graph, or double bar graph).

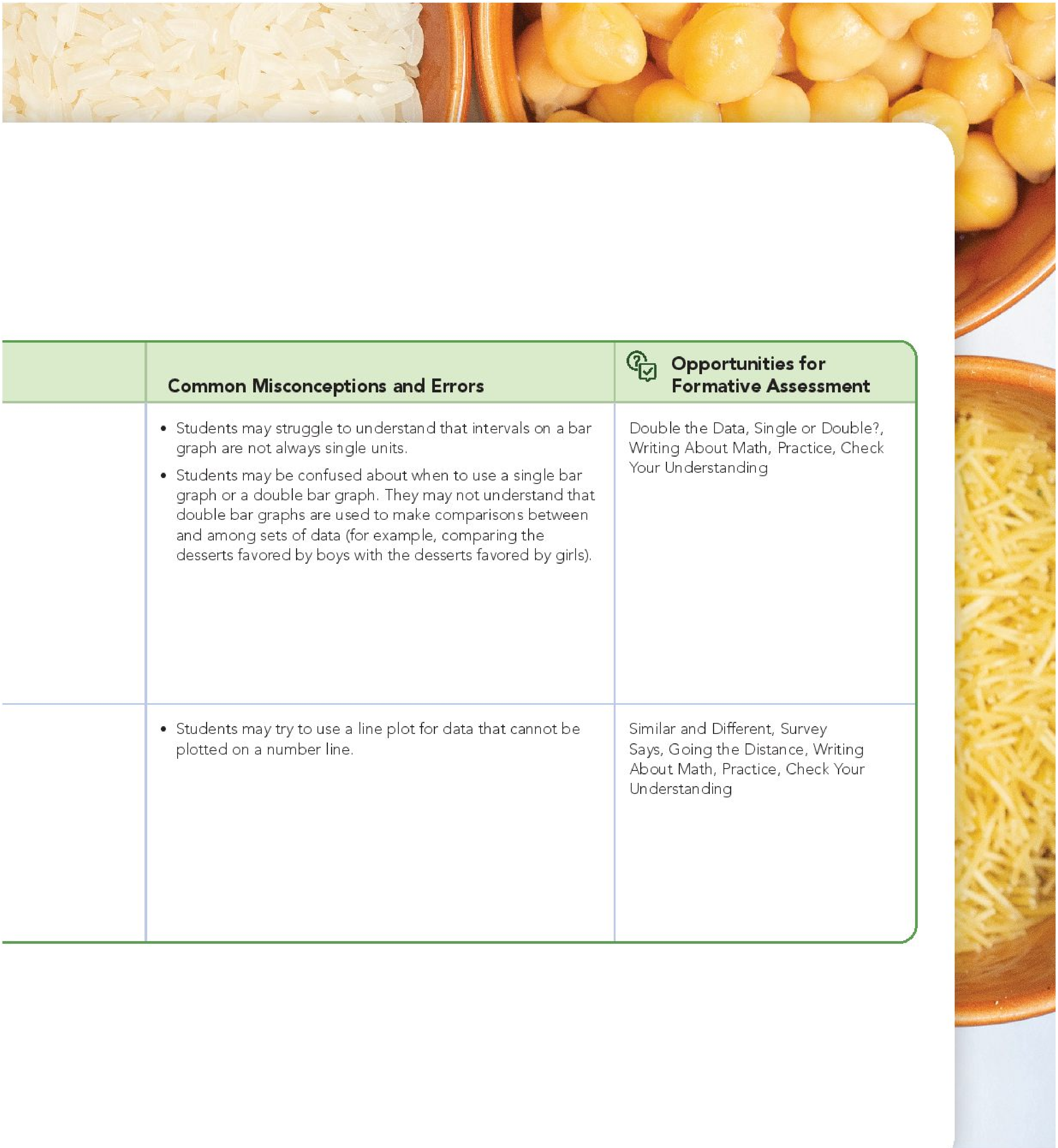
4.D.2.b Solve problems involving addition and subtraction of fractions by using information presented in graphs (for example, from a line plot find and analyze the difference in height between the tallest and shortest students in the classroom).



Concept Planner

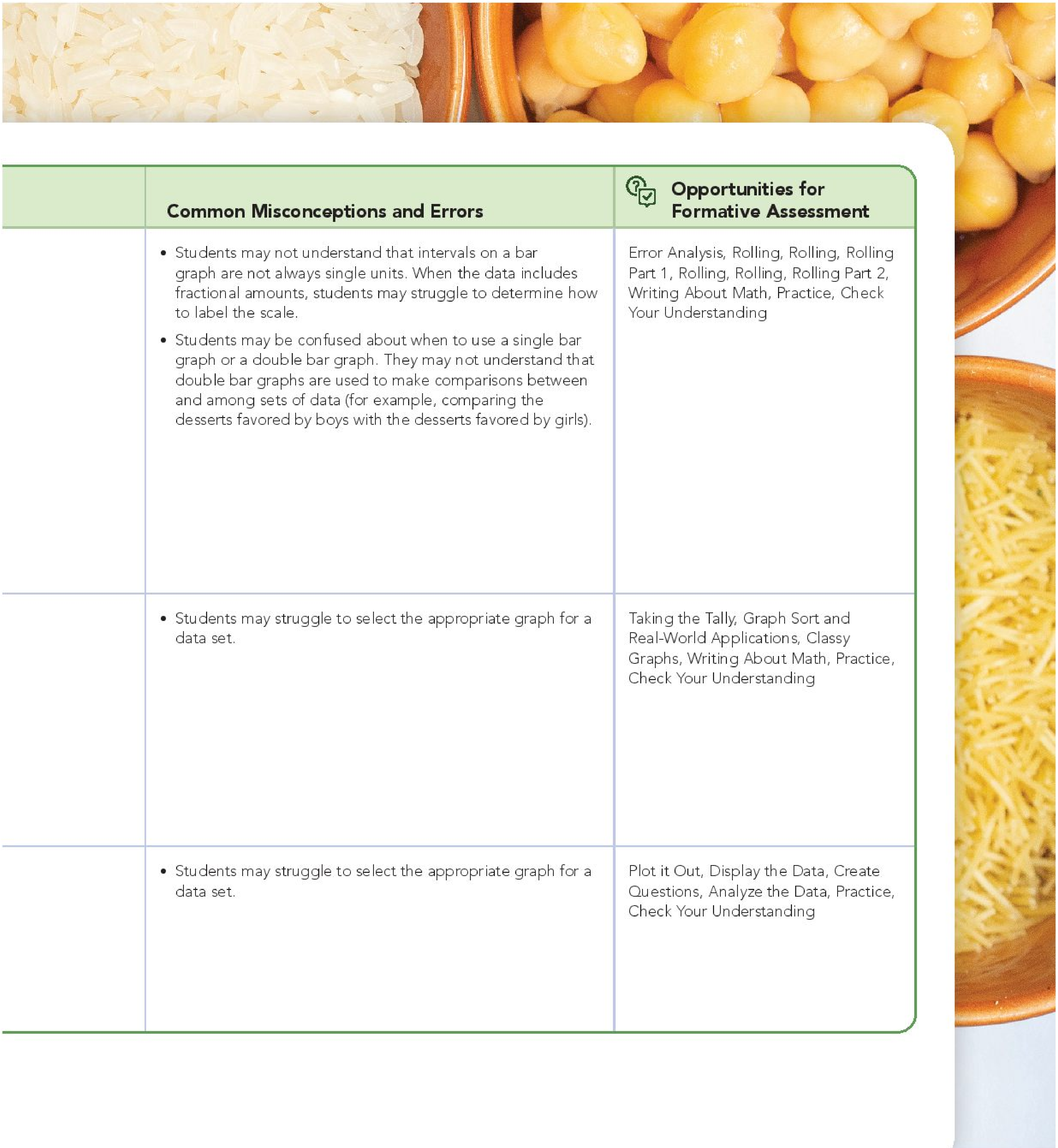
All lessons are designed to be 60 minutes. The materials listed in this chart are items to gather for each group. Items for the class or for individual students are indicated as needed.

Lesson Name	Materials for Lesson	Vocabulary Terms	Learning Objectives	
1 Show Me the Data	• Thinking Like a Mathematician anchor chart • Large version of Unit 11 Lesson 1 Graph of Favorite Flavors of Ice Cream (See the Blackline Masters at the end of the volume.)	Axis Bar graph Categories Data Double bar graph Horizontal Intervals Key Scale Vertical	• Students will distinguish between different types of graphs. • Students will explain the difference between bar graphs and double bar graphs. • Students will explain when it is appropriate to use double bar graphs.	
2 Plotting Along	• No additional materials needed	Frequency Horizontal	• Students will explain why data might include fractions. • Students will construct a line plot using data with fractions. • Students will analyze a line plot using data with fractions.	



	Common Misconceptions and Errors	Opportunities for Formative Assessment
	• Students may struggle to understand that intervals on a bar graph are not always single units. • Students may be confused about when to use a single bar graph or a double bar graph. They may not understand that double bar graphs are used to make comparisons between and among sets of data (for example, comparing the desserts favored by boys with the desserts favored by girls).	Double the Data, Single or Double?, Writing About Math, Practice, Check Your Understanding
	• Students may try to use a line plot for data that cannot be plotted on a number line.	Similar and Different, Survey Says, Going the Distance, Writing About Math, Practice, Check Your Understanding

Lesson Name	Materials for Lesson	Vocabulary Terms	Learning Objectives	
3 Breaking the Bar	- Crayons, markers, or colored pencils	Axis Increments Scale	- Students will construct a bar graph using data with fractions. - Students will analyze a bar graph containing data with fractions. - Students will construct a double bar graph using data with fractions. - Students will analyze a bar graph containing data with fractions.	
4 Data About Us	- Large version of the Our Favorite Foods Table (See Lesson 4 ACCESS Taking the Tally.) - Unit 1 Lesson 4 Graph Sorting Cards (Photocopy the Blackline Master at the end of this volume.) - Glue - Scissors - Rulers (1 per student, or enough for one-half of the class)	Review vocabulary as needed.	- Students will select the most appropriate graph to display a set of data. - Students will construct an appropriate graph to display a set of data. - Students will analyze data in graphs.	
5 Graphing the Class	- Crayons, markers, or colored pencils - Rulers - Large sheet of plain paper (1 per student) - Optional: Graph paper (1 sheet per student)	Review vocabulary as needed.	- Students will ask and answer questions about fractional data in a graph.	



	Common Misconceptions and Errors	Opportunities for Formative Assessment
	• Students may not understand that intervals on a bar graph are not always single units. When the data includes fractional amounts, students may struggle to determine how to label the scale. • Students may be confused about when to use a single bar graph or a double bar graph. They may not understand that double bar graphs are used to make comparisons between and among sets of data (for example, comparing the desserts favored by boys with the desserts favored by girls).	Error Analysis, Rolling, Rolling, Rolling Part 1, Rolling, Rolling, Rolling Part 2, Writing About Math, Practice, Check Your Understanding
	• Students may struggle to select the appropriate graph for a data set.	Taking the Tally, Graph Sort and Real-World Applications, Classy Graphs, Writing About Math, Practice, Check Your Understanding
	• Students may struggle to select the appropriate graph for a data set.	Plot it Out, Display the Data, Create Questions, Analyze the Data, Practice, Check Your Understanding

Lesson Name	Materials for Lesson	Vocabulary Terms	Learning Objectives	
Concept Check-In and Remediation	- Materials may vary	Review concept vocabulary as needed.	- Students will work to correct misconceptions and errors related to creating and analyzing graphs with fraction data.	

Opportunities for Assessment:

In addition to the assessment opportunities included in this chart, each concept will include a Concept Check-In.

	Common Misconceptions and Errors	Opportunities for Formative Assessment
	• Students may not understand that intervals on a bar graph are not always single units. When the data includes fractional amounts, students may struggle to determine how to label the scale. • Students may be confused about when to use a single bar graph or a double bar graph. They may not understand that double bar graphs are used to make comparisons between and among sets of data (for example, comparing the desserts favored by boys with the desserts favored by girls). • Students may try to use a line plot for data that cannot be plotted on a number line. • Students may struggle to select the appropriate graph for a data set.	

LESSON 1
Show Me the Data

Lesson Overview

In this lesson, students review bar graphs, pictographs, and line plots and describe the differences among them. They explore and describe double bar graphs and explain what types of data sets might require double bar graphs.

Lesson Essential Questions

- How does the data affect the type of graph I should use?
- How does analyzing graphs help me better understand data?

Learning Objectives

In this lesson

- Students will distinguish between different types of graphs.
- Students will explain the difference between bar graphs and double bar graphs.
- Students will explain when it is appropriate to use double bar graphs.

Grade-Level Standard

4.D.2 Ask and answer questions by collecting, organizing, and representing appropriate data.

Vocabulary Check-In

axis, bar graph, categories, data, double bar graph, horizontal, intervals, key, scale, vertical

Materials List

- Thinking Like a Mathematician anchor chart
- Large version of Unit 11 Lesson 1 Graph of Favorite Flavors of Ice Cream (See the Blackline Masters at the end of the volume.)

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DIGITAL

Lesson 1

Show Me the Data

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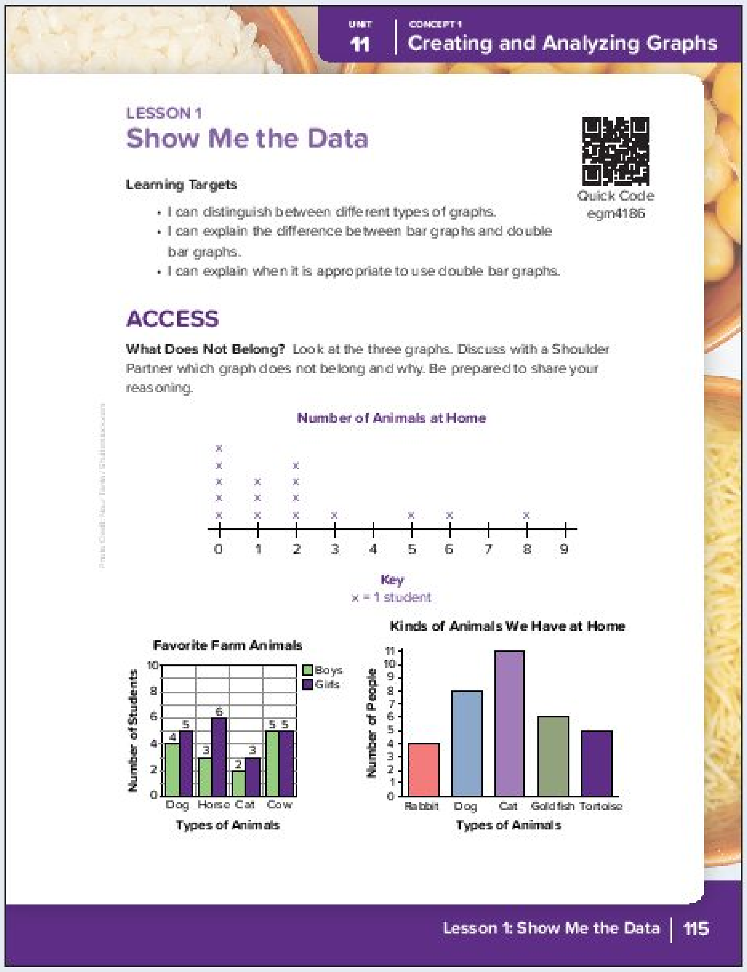


UNIT 11 | CONCEPT 1 Creating and Analyzing Graphs

LESSON 1

Show Me the Data

Quick Code egm4186

Learning Targets

- I can distinguish between different types of graphs.
- I can explain the difference between bar graphs and double bar graphs.
- I can explain when it is appropriate to use double bar graphs.

ACCESS

What Does Not Belong? Look at the three graphs. Discuss with a Shoulder Partner which graph does not belong and why. Be prepared to share your reasoning.

Number of Animals at Home
0
1
2
3
4
5
6
7
8
9
Key
x = 1 student
Favorite Farm Animals
Number of Students
Boys
Girls
4
5
3
6
2
3
5
5
Dog
Horse
Cat
Cow
Types of Animals
Kinds of Animals We Have at Home
Number of People
Rabbit
Dog
Cat
Goldfish
Tortoise
Types of Animals

Lesson 1: Show Me the Data | 115

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may struggle to understand that intervals on a bar graph are not always single units.
- Students may be confused about when to use a single bar graph or a double bar graph. They may not understand that double bar graphs are used to make comparisons between and among sets of data (for example, comparing the desserts favored by boys with the desserts favored by girls).

What Does Not Belong?

1. Direct students to Lesson 1 ACCESS What Does Not Belong? and chorally read the Learning Targets.
2. Ask students to look at the three graphs and discuss with their Shoulder Partner which graph does not belong and why.
3. Use Calling Sticks to choose 4–5 students to share their answers and reasoning.
4. Review the name of each type of graph and ask students to share something they know about each. Tell students that graphs are an effective way to represent collected data and different types of graphs are better for different types of data.

Answer Key for What Does Not Belong?:
There is not necessarily a correct answer to this task. The idea is for students to share what they know about these types of graphs and to explain why one might not belong in a group with the others. Some may say that the line plot does not belong because it does not have bars representing the data. Others may say the double bar graph does not belong because the other two share data about animals at our homes. It is a starting point for a conversation and a way to practice making viable arguments and listening to others thinking. This is one of the mathematical practice standards and referred to on the class chart, Thinking Like A Mathematician.

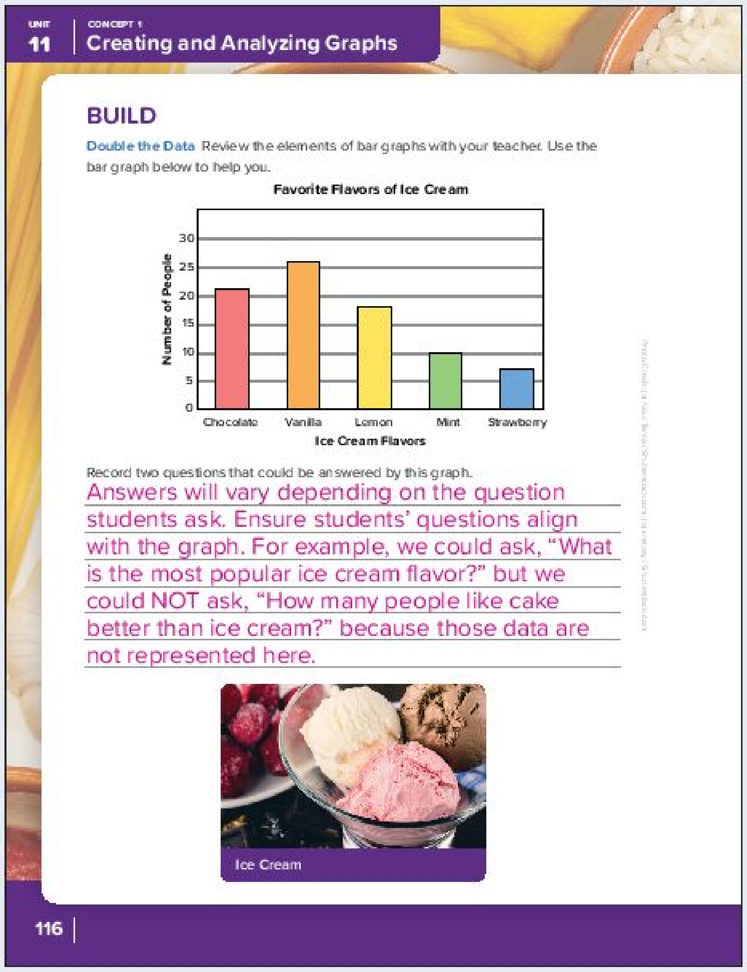
BUILD (40 min)

Double the Data (20 min)

1. Direct students to Lesson 1 BUILD Double the Data.
2. Ask students to help you review the elements of the bar graph and to point to each part in their Student Materials as they name them aloud. Be sure the following elements are identified and discussed:
   - Title: Explains what the graph is about
     Favorite Flavors of Ice Cream
   - Scale: The numbers that represent the quantity of data
     The scale counts by five on the vertical axis.
   - Interval: The space between each number on the scale. If we look from one dark line to the next, this is the interval.
     The intervals are the spaces between 0 and 5, 5 and 10, and so on. If a bar falls between the interval, we have to estimate what is represented.
   - Axes: The labeled vertical and horizontal lines on a graph
     The vertical axis is labeled "Number of People" and the horizontal axis is labeled "Flavors."
   - Labels: Describe what the horizontal and vertical lines of a graph represent
     The label on the vertical axis tells us the numbers mean "Number of People" and the label on the horizontal axis tells us the data refers to "Flavors."
   - Bar: A way to represent data; a rectangle that can go horizontally or vertically
     There are 5 bars on this graph. Each bar represents a different flavor of ice cream.
   - Data: Information shown in a graph; includes quantities or other information to be analyzed
     The data in this graph are different flavors of ice cream. Each flavor is different from the next.
   - Key: Explains what the data representations mean
     There is no key in this graph, but in ACCESS, the line plot had a key that showed that each x represented 1 student.

PRINT

Student Page 116



UNIT 11 | CONCEPT 1 Creating and Analyzing Graphs

BUILD

Double the Data Review the elements of bar graphs with your teacher. Use the bar graph below to help you.

Record two questions that could be answered by this graph.

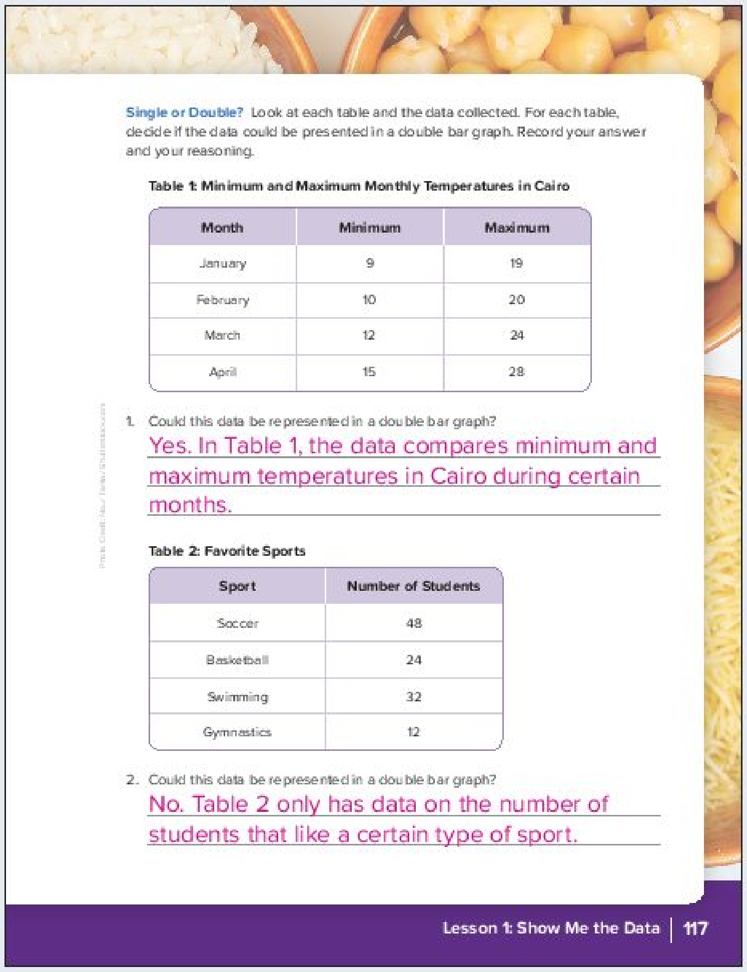
Answers will vary depending on the question students ask. Ensure students' questions align with the graph. For example, we could ask, "What is the most popular ice cream flavor?" but we could NOT ask, "How many people like cake better than ice cream?" because those data are not represented here.

Ice Cream

116

PRINT

Student Page 117



Single or Double? Look at each table and the data collected. For each table, decide if the data could be presented in a double bar graph. Record your answer and your reasoning.

Table 1: Minimum and Maximum Monthly Temperatures in Cairo

Month	Minimum	Maximum
January	9	19
February	10	20
March	12	24
April	15	28

1. Could this data be represented in a double bar graph?
   Yes. In Table 1, the data compares minimum and maximum temperatures in Cairo during certain months.

Table 2: Favorite Sports

Sport	Number of Students
Soccer	48
Basketball	24
Swimming	32
Gymnastics	12

2. Could this data be represented in a double bar graph?
   No. Table 2 only has data on the number of students that like a certain type of sport.

Lesson 1: Show Me the Data | 117

3. Ask students to think about two questions that could be answered by reading the graph and then record them. Ask students to give a Thumbs Up when they are ready to share.

4. Use Calling Sticks to choose 2–3 students to share one of their questions.
   Answers will vary depending on the question students ask. Ensure students' questions align with the graph. For example, we could ask, "What is the most popular ice cream flavor?" but we could NOT ask, "How many people like cake better than ice cream?" because those data are not represented here.

5. Ask the following:

   ASK

   - *What if we separated these data further into boys and girls and found out how many boys liked vanilla ice cream versus how many girls?*
   - *How could we show both the girls' and boys' data on the same graph?*
     Answers will vary.

6. Display your large version of the Favorite Flavors of Ice Cream graph.

7. Ask students to Turn and Talk about what they notice about this graph. How is it similar to and different from the graph in their Student Materials?
   Possible answers: The graphs show the same flavors, have the same title and labels, and use the same scale; there are two bars for each flavor; two bars are the same color but are slightly different; there is a key to show the difference between the solid and striped bars; both boys and girls are represented.

8. Explain that this is called a double bar graph. Double bar graphs show two sets of data on the same graph. This allows us to analyze and compare more complex sets of data. For example, in this graph, we can compare favorite ice cream flavors, but we can also compare data about boys and girls. On a double bar graph, there is also a key to let readers know what each bar in a set represents.

Single or Double? (20 min)

1. Direct students to Lesson 1 BUILD Single or Double?
2. Explain that Tables 1–3 represent sets of data divided into categories. Bar graphs are good ways to represent categorical data. However, there is a difference between what can be represented on a single bar graph and what can be represented on a double bar graph.
3. Have students look at each table and decide if the data could be represented by a double bar graph.
4. For each table, call on students to share their thinking. Reinforce that the data in Tables 1 and 3 could be represented in a double bar graph because the data are divided into two sets that are related to each other.
5. Ask students to analyze Table 4 and answer the questions about the data. Students who finish early should check their work with a partner.
6. Use the last 5 minutes of BUILD to review the answers as a class.

CONNECT (7 min)

Writing About Math

Direct students to Lesson 1 CONNECT Writing About Math and ask them to respond to the prompt. Use Calling Sticks to select students to share their thinking with the class.

WRAP-UP (3 min)

Let's Chat About Our Learning

Ask volunteers to share their Writing About Math responses. For students who answer incorrectly, ask questions to help them identify a second set of data that could go in the double bar graph.

PRINT

Student Page 118

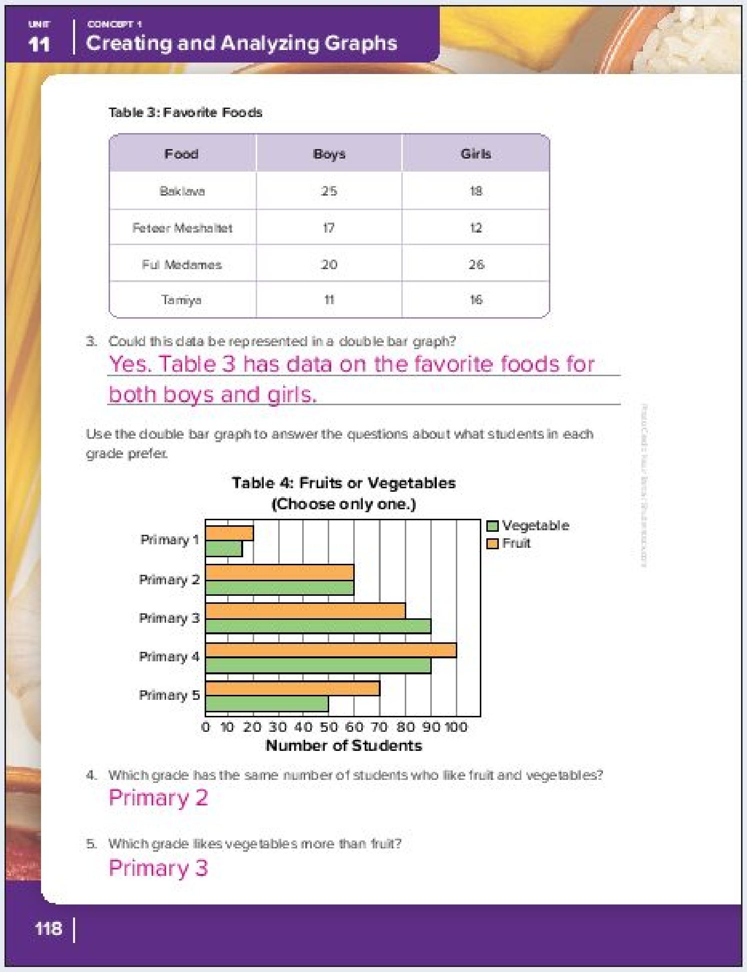


Table 3: Favorite Foods

Food	Boys	Girls
Baklava	25	18
Feteer Meshaltet	17	12
Ful Medames	20	26
Tamiya	11	16

3. Could this data be represented in a double bar graph?
Yes. Table 3 has data on the favorite foods for both boys and girls.

Use the double bar graph to answer the questions about what students in each grade prefer.

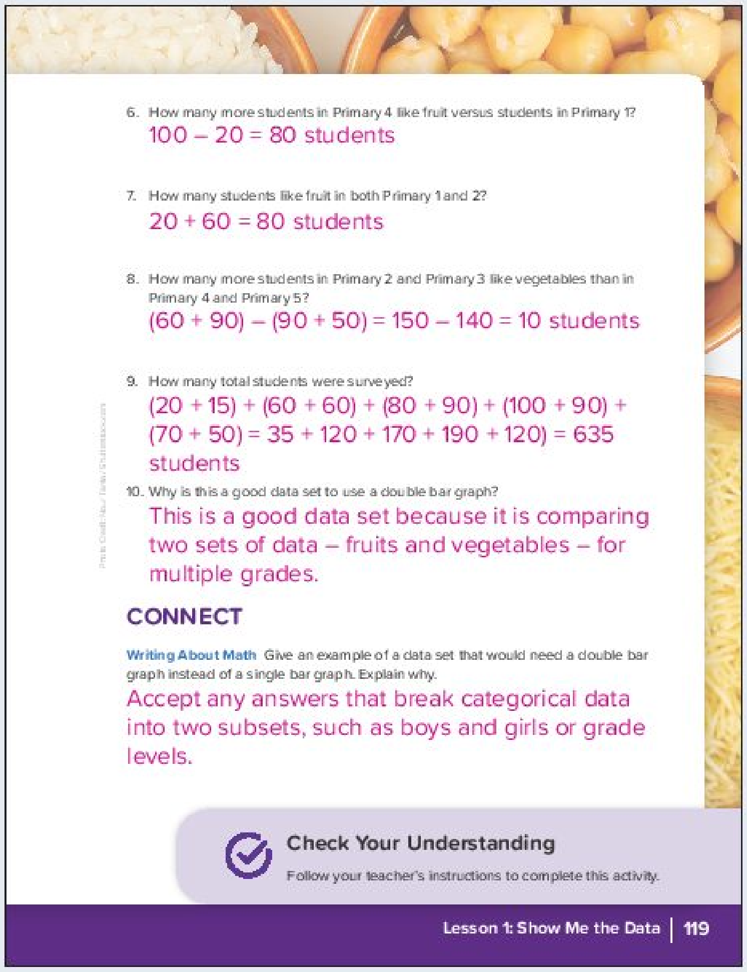
Table 4: Fruits or Vegetables (Choose only one.)

4. Which grade has the same number of students who like fruit and vegetables?
Primary 2

5. Which grade likes vegetables more than fruit?
Primary 3

PRINT

Student Page 119



6. How many more students in Primary 4 like fruit versus students in Primary 1?
$100 – 20 = 80$ students

7. How many students like fruit in both Primary 1 and 2?
$20 + 60 = 80$ students

8. How many more students in Primary 2 and Primary 3 like vegetables than in Primary 4 and Primary 5?
$(60 + 90) – (90 + 50) = 150 – 140 = 10$ students

9. How many total students were surveyed?
$(20 + 15) + (60 + 60) + (80 + 90) + (100 + 90) + (70 + 50) = 35 + 120 + 170 + 190 + 120) = 635$ students

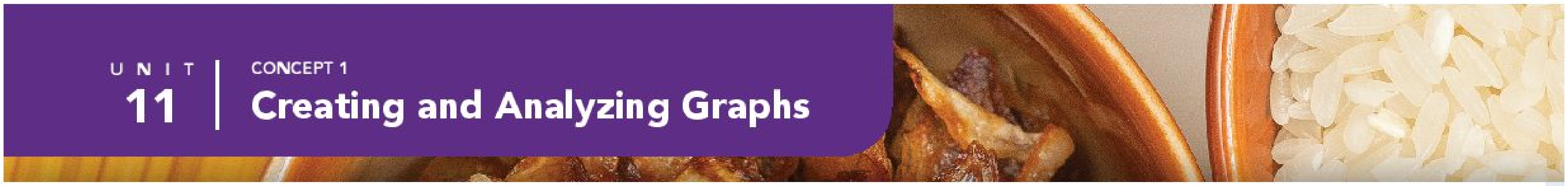
10. Why is this a good data set to use a double bar graph?
This is a good data set because it is comparing two sets of data – fruits and vegetables – for multiple grades.

CONNECT

Writing About Math Give an example of a data set that would need a double bar graph instead of a single bar graph. Explain why.
Accept any answers that break categorical data into two subsets, such as boys and girls or grade levels.

Check Your Understanding

Follow your teacher's instructions to complete this activity.



PRACTICE

Direct students to Lesson 1 PRACTICE and have them complete the problems. Address student errors and misconceptions related to graphs.

Check Your Understanding

Answer the questions about the double bar graph.

1. Which activity is the least preferred for both boys and girls?
   Jump rope
2. What is the difference between the number of girls who like soccer and the number of girls who like to spend time with friends?
   11 – 5 = 6 girls
3. How many boys were surveyed?
   9 + 6 + 1 = 16 boys
4. Write a question that this double bar graph could answer, and then answer it.
   Accept any question that is related to the graph and has a correct answer based on the data.
5. A teacher is tracking the number of books individual students read in the months of June and July. Circle the type of graph she should use to compare the two months for each student. Then, explain your thinking.
   Double bar graph. Accept any answer that explain that the data are comparing two months for each student so a double bar graph would be the best choice.
6. Ola collected data on how many jumping jacks every student in her class could do in 1 minute. Circle the type of graph she could make to show how many students could complete each number of jumping jacks. Then, explain your thinking.
   Line plot. Accept any answer that explains that these data are about how many people can do jumping jacks at a certain time. A line plot would be the best choice since it shows the frequency of a certain number of jumping jacks done in a minute. Students might also choose a bar graph and have one bar for every student, but that would not be efficient.

Materials List

- No additional materials are needed

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DIGITAL

Lesson 2

Plotting Along

Quick Code:
egmt4187

LESSON 2
Plotting Along

Lesson Overview

In this lesson, students compare and contrast line plots and bar graphs. They review the type of data represented in a line plot. Students use data to create line plots and answer questions about them. They learn why the data in a line plot may include fractions and practice using fractional data to make and analyze line plots.

Lesson Essential Questions

- How does the data affect the type of graph I should use?
- How does analyzing graphs help me better understand data?

Learning Objectives

In this lesson

- Students will explain why data might include fractions.
- Students will construct a line plot using data with fractions.
- Students will analyze a line plot using data with fractions.

Grade-Level Standards

4.D.2 Ask and answer questions by collecting, organizing, and representing appropriate data.

4.D.2.a Select and make an appropriate graph to display a data set of measurements in fractions of a unit (for example, line plot, bar graph, or double bar graph).

Vocabulary Check-In

frequency, horizontal

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may try to use a line plot for data that cannot be plotted on a number line.

Similar and Different

1. Ask students to think about when fractions could be used in a graph. Prompt students' thinking using questions such as the following:

ASK
   - *What types of information are recorded in fractions?*
     Answers may include measurements of length, weight, volume, and time or data related to parts of wholes or sets.
   - *What types of data could be collected in fractions?*
     Answers may include height, shoe size, amount of precipitation, length of time for an activity, and so on.

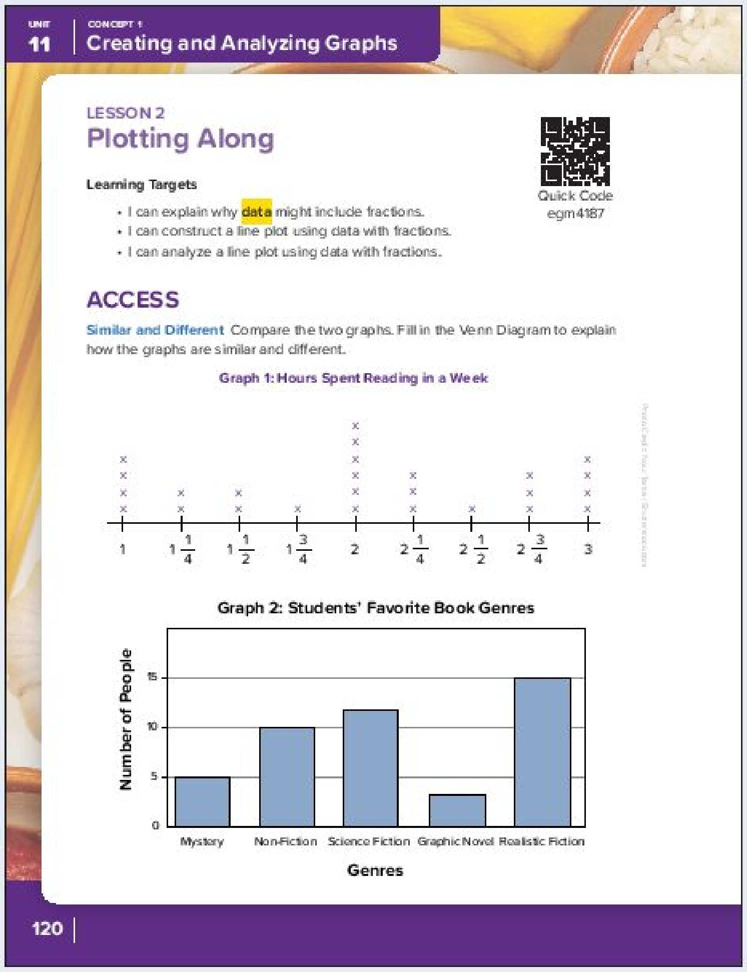
2. Direct students to Lesson 2 ACCESS Similar and Different and chorally read the Learning Targets.
3. Ask students to compare the two graphs and fill in the Venn Diagram with their Shoulder Partner. If necessary, review Venn diagrams with students and explain how they are used to show similarities and differences.
4. Ask students to share their answers. Discuss.

Answer Key for Similar and Different:
Accept any reasonable answers. Students' answers may include:

- Both graphs show data related to reading.
- Both graphs record numbers.
- Both graphs show numbers of students.
- One graph has fraction data.
- One is a bar graph and the other is a line plot.
- One graph shows fractions of hours and the other shows genres of literature.

PRINT

Student Page 120



UNIT 11 | CONCEPT 1 Creating and Analyzing Graphs

LESSON 2
Plotting Along

Quick Code
egm4187

Learning Targets

- I can explain why data might include fractions.
- I can construct a line plot using data with fractions.
- I can analyze a line plot using data with fractions.

ACCESS

Similar and Different Compare the two graphs. Fill in the Venn Diagram to explain how the graphs are similar and different.

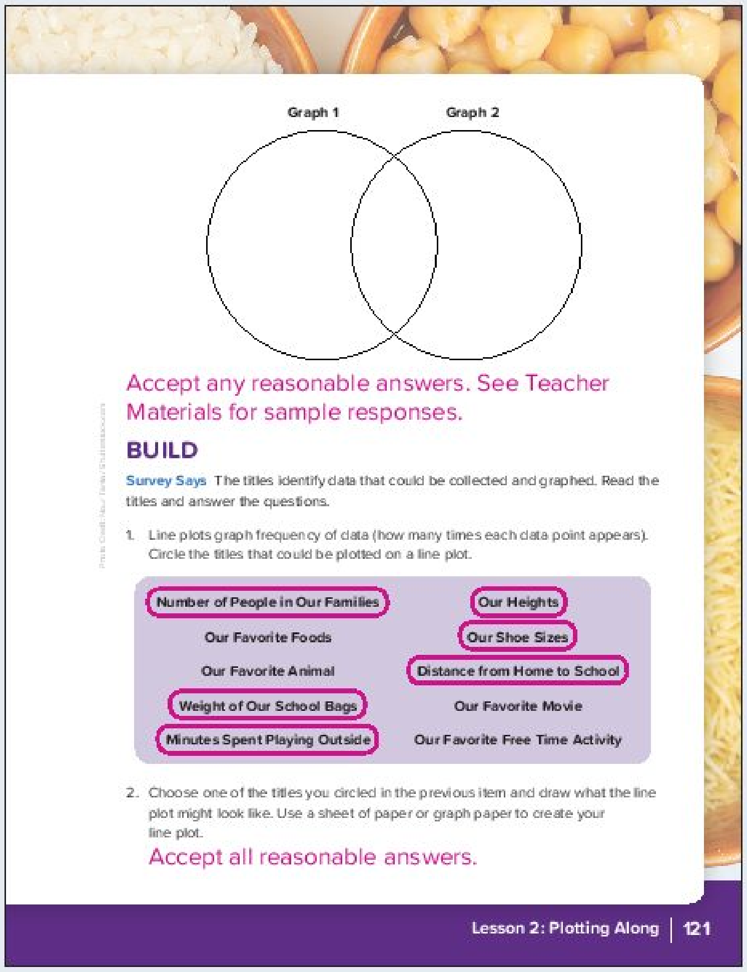
Graph 1: Hours Spent Reading in a Week

Graph 2: Students' Favorite Book Genres

120

PRINT

Student Page 121



Accept any reasonable answers. See Teacher Materials for sample responses.

BUILD

Survey Says The titles identify data that could be collected and graphed. Read the titles and answer the questions.

1. Line plots graph frequency of data (how many times each data point appears). Circle the titles that could be plotted on a line plot.

[✓ Number of People in Our Families]
Our Favorite Foods
Our Favorite Animal
[✓ Weight of Our School Bags]
[✓ Minutes Spent Playing Outside]
[✓ Our Heights]
[✓ Our Shoe Sizes]
[✓ Distance from Home to School]
Our Favorite Movie
Our Favorite Free Time Activity

2. Choose one of the titles you circled in the previous item and draw what the line plot might look like. Use a sheet of paper or graph paper to create your line plot.
   Accept all reasonable answers.

Lesson 2: Plotting Along | 121

BUILD (40 min)

Survey Says (15 min)

1. Remind students that a line plot shows the frequency of data on a horizontal number line. Frequency means how often something happens. The line plot in ACCESS showed the frequency of hours spent reading. It showed the frequency of people who spent each amount of time reading. An **X** is used to plot data. When creating a line plot, the data must be numbers because it is plotted on a number line.

2. Ask students to talk with their Shoulder Partner about an example of data they could represent with a line plot. After a minute, call on students to share their examples.

3. Direct students to Lesson 2 BUILD Survey Says and tell them they will decide whether or not survey data can be represented with a line plot.

4. Use the last 5 minutes of BUILD to review the answers. Ask student volunteers to share the sample number line they made from the data.

Going the Distance (15 min)

1. Direct students to Lesson 2 BUILD Going the Distance. Ask them to read the directions independently and look at the data.

2. Ask students:

ASK

- *What will this line plot tell us?*
  The distance from students' homes to school

- What do the fractions represent?
  They are fractions of a kilometer

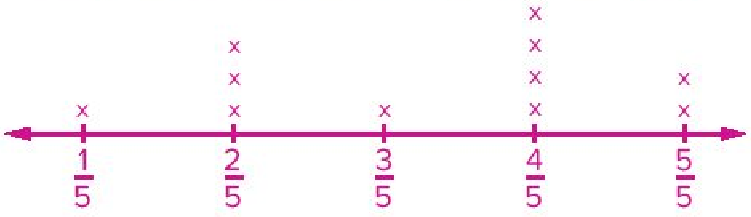
3. Ask students how they will determine the scale for their line plot.
   They should look at the smallest and largest fraction first and then plot the fractions in between.

4. Remind students to represent the frequency of each fraction of a kilometer on the number line with an **X** and to include a Key. Give students 5–8 minutes to plot the data and answer the questions at the bottom. Students may work independently, with a partner, or in a small group with you, depending on their needs.

5. Use the last 5 minutes of BUILD to discuss the answers. Make sure students understand how to analyze a line plot before moving on.

Answer Key for Going the Distance:

Distance from Home to School (in Kilometers)



1. 11 students
2. $\frac{1}{5}$ km
3. $\frac{5}{5}$ km or 1 km
4. $\frac{4}{5}$ km
5. $\frac{1}{5}$ km and $\frac{3}{5}$ km
6. Answers will vary, but students' statements should reflect the data in the line plot.

CONNECT (7 min)

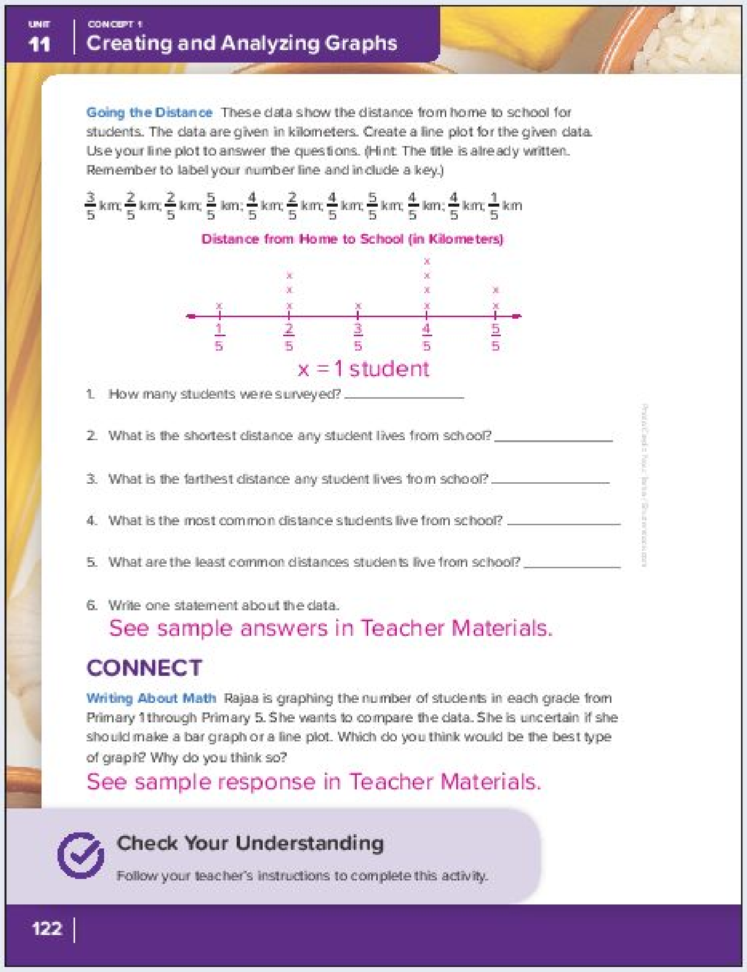
Writing About Math

Direct students to Lesson 2 CONNECT Writing About Math. Ask students to read the prompt and respond to the question.

Answer Key for Writing About Math:
A line plot would be best because the graph represents the number of students per grade, so the data will be in the form of a number. Students may also select to use a bar graph. Accept all answers for which students can provide an appropriate rationale.

PRINT

Student Page 122



UNIT 11 | CONCEPT 1 Creating and Analyzing Graphs

Going the Distance These data show the distance from home to school for students. The data are given in kilometers. Create a line plot for the given data. Use your line plot to answer the questions. (Hint: The title is already written. Remember to label your number line and include a key.)

$\frac{3}{5}$ km; $\frac{2}{5}$ km; $\frac{2}{5}$ km; $\frac{5}{5}$ km; $\frac{4}{5}$ km; $\frac{2}{5}$ km; $\frac{4}{5}$ km; $\frac{5}{5}$ km; $\frac{4}{5}$ km; $\frac{4}{5}$ km; $\frac{1}{5}$ km

Distance from Home to School (in Kilometers)

x = 1 student

1. How many students were surveyed? ______
2. What is the shortest distance any student lives from school? ______
3. What is the farthest distance any student lives from school? ______
4. What is the most common distance students live from school? ______
5. What are the least common distances students live from school? ______
6. Write one statement about the data.
See sample answers in Teacher Materials.

CONNECT

Writing About Math Rajaa is graphing the number of students in each grade from Primary 1 through Primary 5. She wants to compare the data. She is uncertain if she should make a bar graph or a line plot. Which do you think would be the best type of graph? Why do you think so?
See sample response in Teacher Materials.

Check Your Understanding
Follow your teacher's instructions to complete this activity.

122

WRAP-UP (3 min)

Let's Chat About Our Learning

Ask volunteers to share their Writing About Math responses, including their reasoning. Advise students that they could choose either type of graph as long as they can provide a mathematically appropriate rationale.

PRACTICE

Direct students to Lesson 2 PRACTICE and have them complete the problems. Address student errors and misconceptions related to creating and analyzing graphs with data in fractions.

Check Your Understanding

1. Which measurements are not represented by the data on the line plot?
   $\frac{5}{7}$ L; $\frac{6}{7}$ L
2. What is the most common amount of liquid?
   $\frac{4}{7}$ L
3. Did more containers hold $\frac{2}{7}$ or $\frac{3}{7}$ liters of water?
   $\frac{2}{7}$ L
4. How many containers hold more than $\frac{4}{7}$ liters?
   2 containers
5. How many containers are there in all?
   13 containers

LESSON 3
Breaking the Bar

Lesson Overview

In this lesson, students return to representing data with bar graphs. They review line plots with fractional parts in an error analysis and then apply that understanding to bar graphs. Students use a table with distances that include fractions and create a bar graph with a fractional scale. Then they add additional data to a double bar graph and use the graph to answer questions analyzing the data set.

Lesson Essential Questions

- How does the data affect the type of graph I should use?
- How does analyzing graphs help me better understand data?

Learning Objectives

In this lesson

- Students will construct a bar graph using data with fractions.
- Students will analyze a bar graph containing data with fractions.
- Students will construct a double bar graph using data with fractions.
- Students will analyze a bar graph containing data with fractions.

Grade-Level Standards

4.D.2 Ask and answer questions by collecting, organizing, and representing appropriate data.

4.D.2.a Select and make an appropriate graph to display a data set of measurements in fractions of a unit (for example, line plot, bar graph, or double bar graph).

Vocabulary Check-In

axis, increments, scale

Materials List

- Crayons, markers, or colored pencils

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DIGITAL

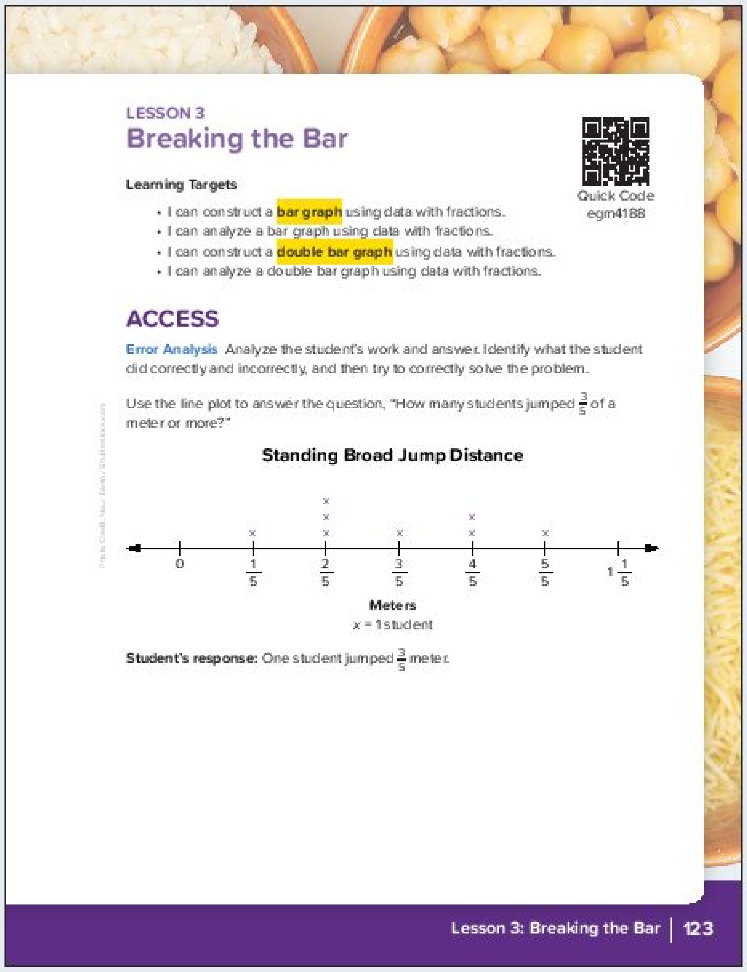
Lesson 3

Breaking the Bar

Quick Code:
egmt4188

PRINT

Student Page 123



LESSON 3

Breaking the Bar

Quick Code
egm4188

Learning Targets

- I can construct a **bar graph** using data with fractions.
- I can analyze a bar graph using data with fractions.
- I can construct a **double bar graph** using data with fractions.
- I can analyze a double bar graph using data with fractions.

ACCESS

Error Analysis Analyze the student's work and answer. Identify what the student did correctly and incorrectly, and then try to correctly solve the problem.

Use the line plot to answer the question, "How many students jumped $\frac{3}{5}$ of a meter or more?"

Standing Broad Jump Distance

Student's response: One student jumped $\frac{3}{5}$ meter.

Lesson 3: Breaking the Bar | 123

ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may not understand that intervals on a bar graph are not always single units. When the data includes fractional amounts, students may struggle to determine how to label the scale.
- Students may be confused about when to use a single bar graph or a double bar graph. They may not understand that double bar graphs are used to make comparisons between and among sets of data (for example, comparing the desserts favored by boys with the desserts favored by girls).

Error Analysis

Direct students to Lesson 3 ACCESS Error Analysis and chorally read the Learning Targets. Ask students to complete the error analysis. After a few minutes, ask students to share their answers and their reasoning.

Answer Key for Error Analysis:
The student correctly identified that one student jumped $\frac{3}{5}$ of a meter, but they did not add on the other 3 students that jumped "more than" $\frac{3}{5}$ of a meter. The correct answer is 4 students.

BUILD (40 min)

Rolling, Rolling, Rolling Part 1 (25 min)

1. Ask students to turn to Lesson 3 BUILD Rolling, Rolling, Rolling Part 1 and read the problem.
2. Ask students to identify the elements they would need to include if they were to create a bar graph of the data.
   Ensure students list all elements of a bar graph: title, labels, scale, bars.
3. Ask students to talk to a partner about how to create the scale using the fractions listed. Use the following questions as needed to prompt students:

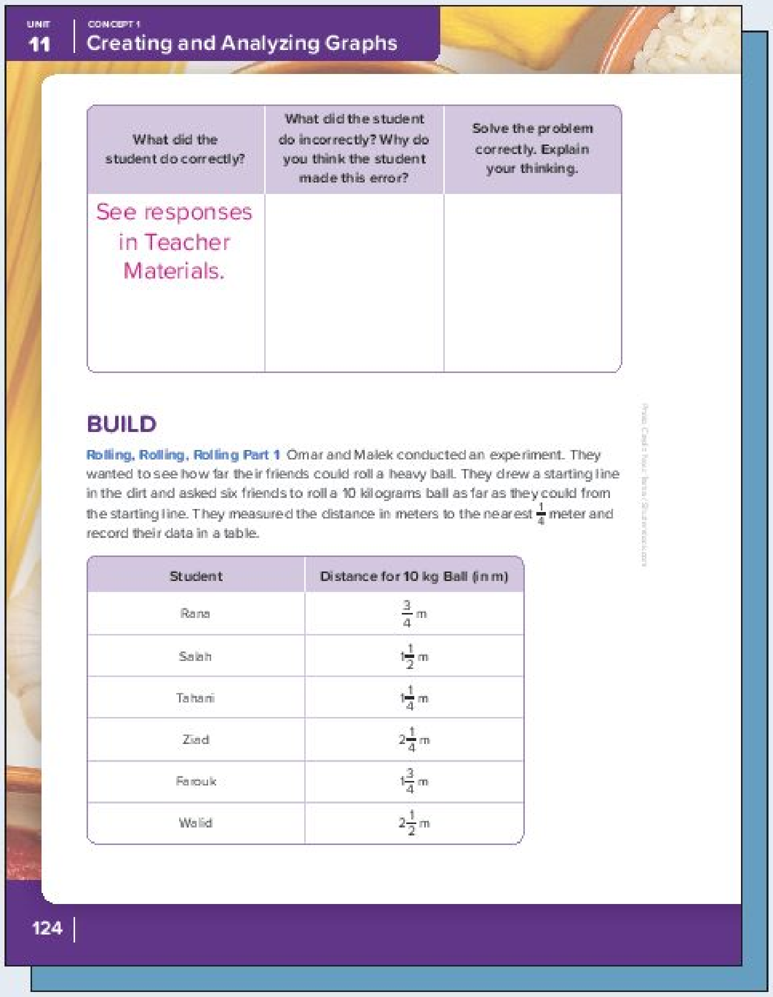
ASK

- *Should the vertical axis start at zero?*
  Yes, bar graphs start at zero.
- *What should be the last interval on the scale? Think about how you labeled the line plots with fractions in Lesson 2.*
  The scale should stop at 3 ,which is the next whole number from the last fractional data point.
- *What should the increments be?*
  The increments should be in $\frac{1}{4}$ meters. Each interval represents $\frac{1}{4}$ of a meter.

4. Direct students to the grid paper in their Student Materials, where they will draw their bar graph. The axis lines are already drawn. As a group, label the vertical axis Distance in Meters and the horizontal axis Students. Label each line in $\frac{1}{4}$ increments starting at 0 and ending at 3.

PRINT

Student Pages 124–125



UNIT 11 | CONCEPT 1 Creating and Analyzing Graphs

What did the student do correctly?	What did the student do incorrectly? Why do you think the student made this error?	Solve the problem correctly. Explain your thinking.
See responses in Teacher Materials.		

BUILD

Rolling, Rolling, Rolling Part 1 Omar and Malek conducted an experiment. They wanted to see how far their friends could roll a heavy ball. They drew a starting line in the dirt and asked six friends to roll a 10 kilograms ball as far as they could from the starting line. They measured the distance in meters to the nearest $\frac{1}{4}$ meter and record their data in a table.

Student	Distance for 10 kg Ball (in m)
Rana	$\frac{3}{4}$ m
Salah	$1\frac{1}{2}$ m
Tahani	$1\frac{1}{4}$ m
Ziad	$2\frac{1}{4}$ m
Farouk	$1\frac{3}{4}$ m
Walid	$2\frac{1}{2}$ m

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5. Ask students:

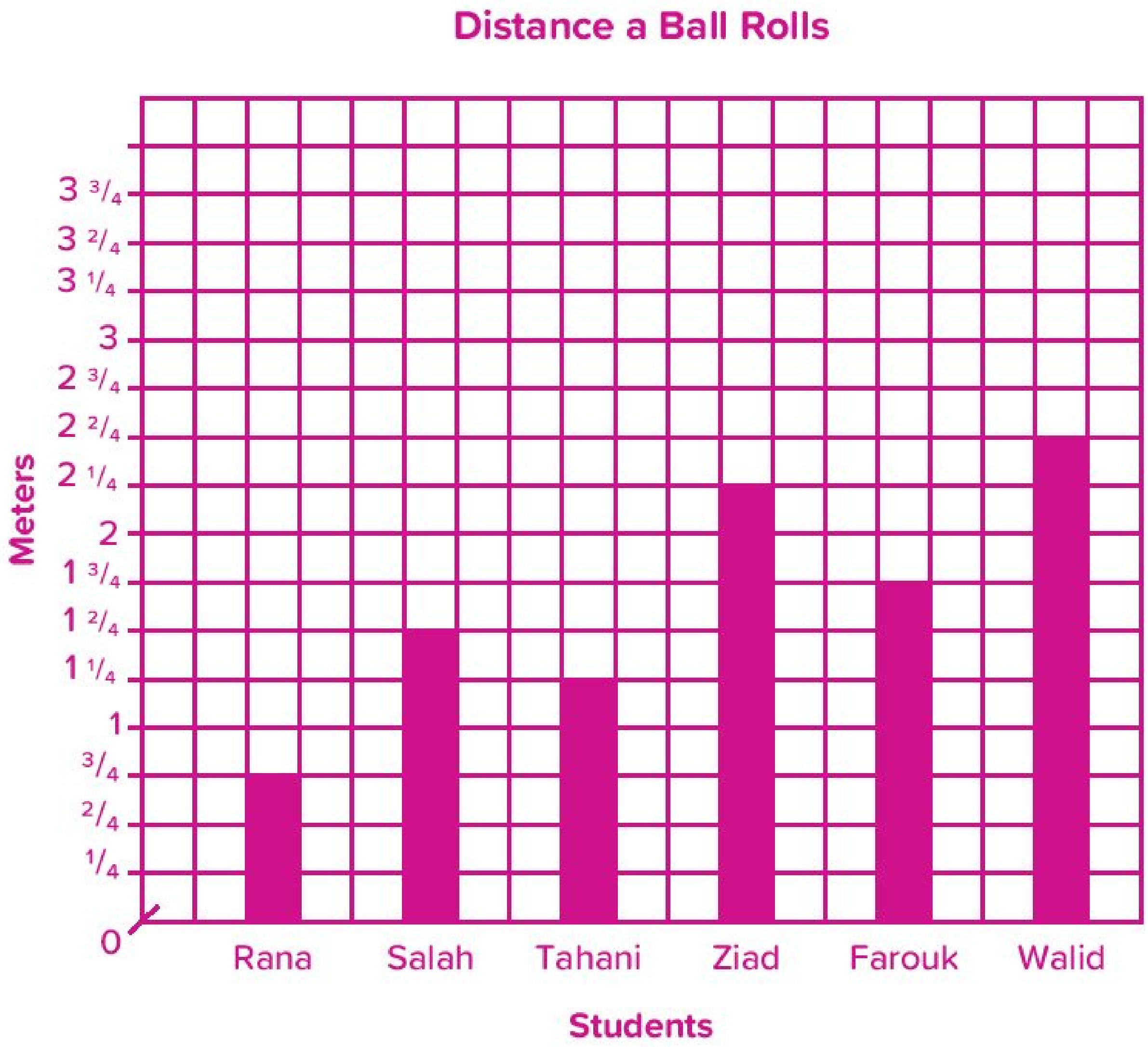
ASK

- *Could we label the line $\frac{2}{4}$ with another fraction that is equivalent to $\frac{2}{4}$?*
  $\frac{1}{2}$
- *When we get to $\frac{4}{4}$ what should we label the line?*
  1
- *How many fourths have we labeled when we get to 2 meters? 3 meters?*
  $\frac{8}{4}$, $\frac{12}{4}$

6. Work with students to create a bar for Rana's data. Label Rana below the bar and ask students to leave two spaces between each student's bar. (This is to leave room for a second bar, which students will add in the next segment.)

7. Give students 5–10 minutes to finish the bar graph for the rest of the data presented. Students can work in groups of 2 or 3. If they finish early, they can create questions and answer them.

Answer Key to Rolling, Rolling, Rolling Part 1:



Rolling, Rolling, Rolling Part 2 (15 min)

1. Direct students to Lesson 3 BUILD Rolling, Rolling, Rolling Part 2 and read the problem with students.
2. Ask:

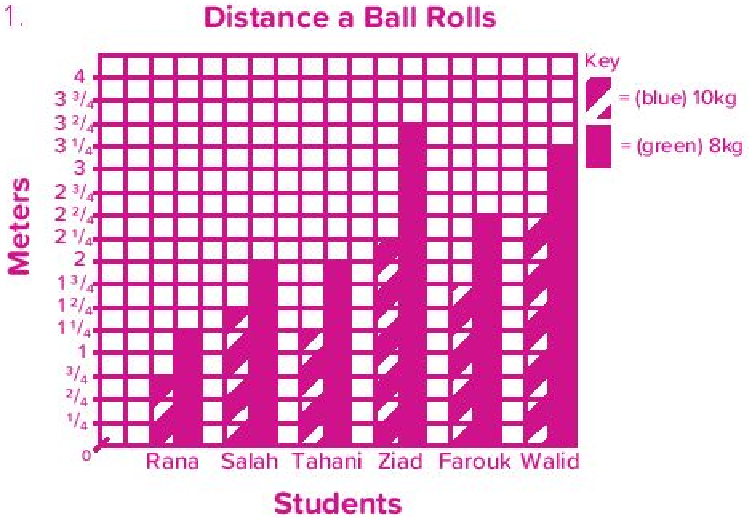
ASK

- *If Omar and Malek wanted to add this new data to their graph, how could they do that?*
  Create a second bar next to each one from above.
- *Ziad rolled an 8 kilograms ball more than 3 meters. How should we alter our graph to include those data?*
  Add $\frac{1}{4}$ increments up to 4.
- *Why would a double bar graph be a good choice to show these data?*
  The two data sets are related and can be compared more easily with a double bar graph.

3. Ask students to go back to the original graph and add the new data to make it a double bar graph. Remind students to use a different color for their new bar and to add a key to show what each bar represents. If students finish early, they should answer the questions.

Answer Key to Rolling, Rolling, Rolling Part 2:

1.



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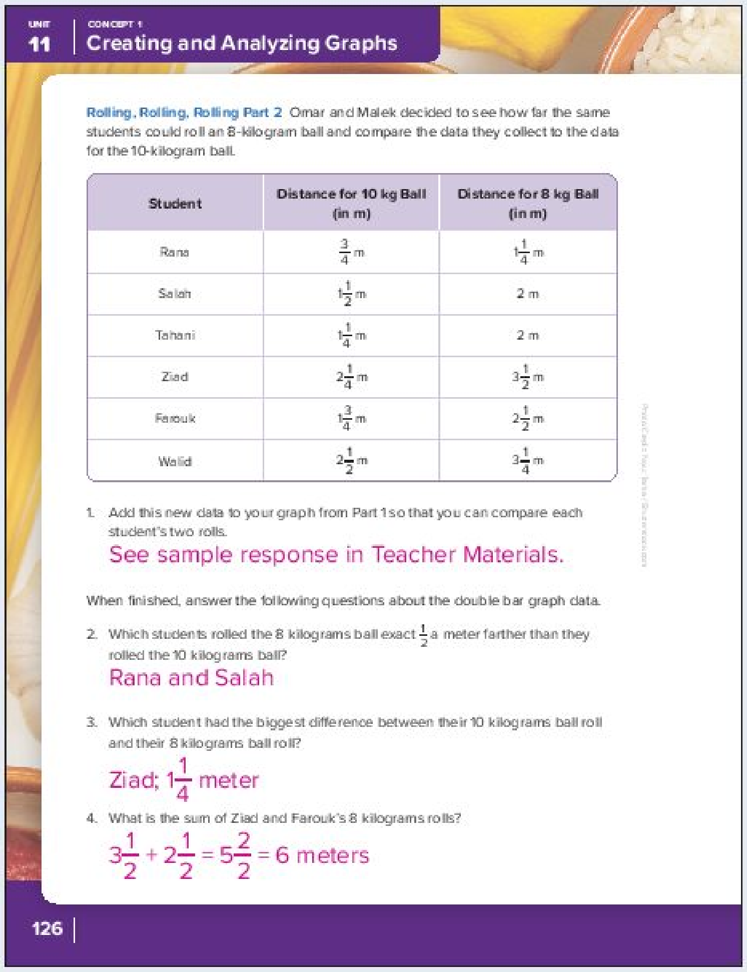
Student Page 126



UNIT 11 | CONCEPT 1 Creating and Analyzing Graphs

Rolling, Rolling, Rolling Part 2 Omar and Malek decided to see how far the same students could roll an 8-kilogram ball and compare the data they collect to the data for the 10-kilogram ball.

Student	Distance for 10 kg Ball (in m)	Distance for 8 kg Ball (in m)
Rana	$\frac{3}{4}$ m	$1\frac{1}{4}$ m
Salah	$1\frac{1}{2}$ m	2 m
Tahani	$1\frac{1}{4}$ m	2 m
Ziad	$2\frac{1}{4}$ m	$3\frac{1}{2}$ m
Farouk	$1\frac{3}{4}$ m	$2\frac{1}{2}$ m
Walid	$2\frac{1}{2}$ m	$3\frac{1}{4}$ m

1. Add this new data to your graph from Part 1 so that you can compare each student's two rolls.
   See sample response in Teacher Materials.

When finished, answer the following questions about the double bar graph data.

2. Which students rolled the 8 kilograms ball exact $\frac{1}{2}$ a meter farther than they rolled the 10 kilograms ball?
   Rana and Salah
3. Which student had the biggest difference between their 10 kilograms ball roll and their 8 kilograms ball roll?
   Ziad; $1\frac{1}{4}$ meter
4. What is the sum of Ziad and Farouk's 8 kilograms rolls?
   $3\frac{1}{2} + 2\frac{1}{2} = 5\frac{2}{2} = 6$ meters

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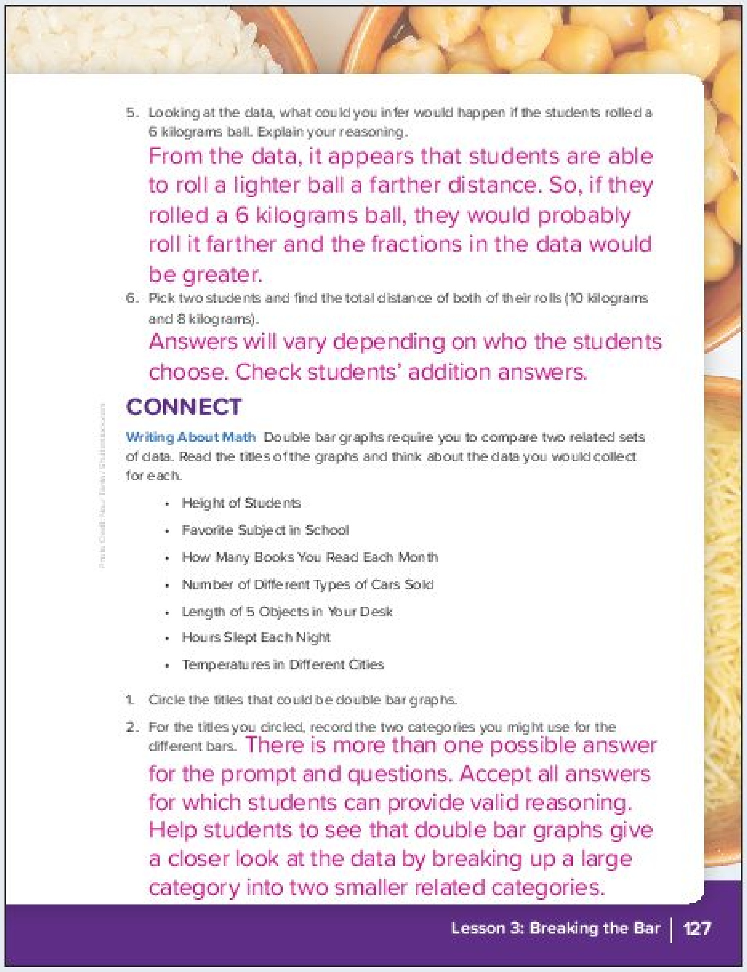


5. Looking at the data, what could you infer would happen if the students rolled a 6 kilograms ball. Explain your reasoning.
   From the data, it appears that students are able to roll a lighter ball a farther distance. So, if they rolled a 6 kilograms ball, they would probably roll it farther and the fractions in the data would be greater.
6. Pick two students and find the total distance of both of their rolls (10 kilograms and 8 kilograms).
   Answers will vary depending on who the students choose. Check students' addition answers.

CONNECT

Writing About Math Double bar graphs require you to compare two related sets of data. Read the titles of the graphs and think about the data you would collect for each.

- Height of Students
- Favorite Subject in School
- How Many Books You Read Each Month
- Number of Different Types of Cars Sold
- Length of 5 Objects in Your Desk
- Hours Slept Each Night
- Temperatures in Different Cities

1. Circle the titles that could be double bar graphs.
2. For the titles you circled, record the two categories you might use for the different bars. There is more than one possible answer for the prompt and questions. Accept all answers for which students can provide valid reasoning. Help students to see that double bar graphs give a closer look at the data by breaking up a large category into two smaller related categories.

Lesson 3: Breaking the Bar | 127

CONNECT (7 min)

Writing About Math

Direct students to Lesson 3 CONNECT Writing About Math and ask a volunteer to read the prompt aloud. Give students time to respond to the prompt.

WRAP-UP (3 min)

Let's Chat About Our Learning

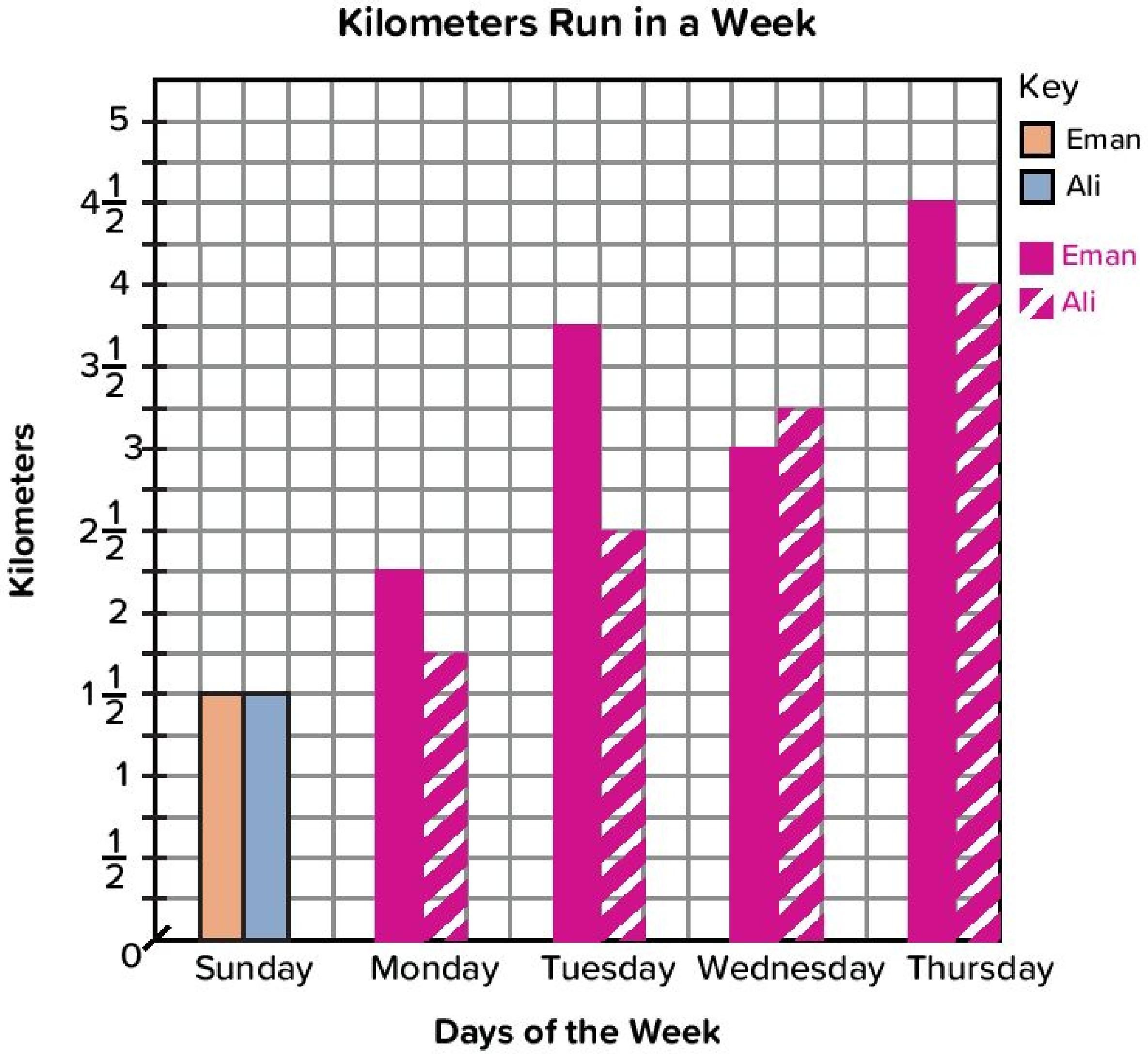
Ask students which of the data sets might include fractions. Call on students to share their thinking. Encourage students to ask questions of each other as they build understanding of fraction data in graphs. The most likely titles include Height of Students, Length of 5 Objects in Your Desk, Hours Slept Each Night, and Temperatures in Different Cities. Some students may provide a rationale for How Many Books You Read Each Month. Students should recognize that the data that involves measurement is most likely to include fractions.

PRACTICE

Direct students to Lesson 3 PRACTICE and have them complete the problems. Address student errors and misconceptions related to bar graphs.

Check Your Understanding

1. Finish the double bar graph showing the rest of the week's data.
   Accept any title that is appropriate for the data.



2. On which day did Eman and Ali's totals equal 4 kilometers?
   Monday; $2\frac{1}{4} + 1\frac{3}{4} = 4$ km

3. How many total kilometers did Eman run while training?
   $1\frac{1}{2} + 2\frac{1}{4} + 3\frac{3}{4} + 3 + 4\frac{1}{2} = 15$ km

4. How many total kilometers did Ali run while training?
   $1\frac{1}{2} + 1\frac{3}{4} + 2\frac{1}{2} + 3\frac{1}{4} + 4 = 13$ km

5. On what day did Eman run twice as far as he did on Sunday?
   Wednesday; $1\frac{1}{2} + 1\frac{1}{2} = 3$ km

Photo Credit: Nour Tarek/Shutterstock.com

LESSON 4
Data About Us

Lesson Overview

In this lesson, students create tables to collect information and make graphs. They sort different graphs and tables into three categories: bar graph, double bar graph, and line plot. Students collect data about their small groups, which they will use in Lesson 5 to design their own graphs. They practice making statements and asking questions about data in graphs and decide which type of graph is best for different data sets.

Lesson Essential Questions

- How does the data affect the type of graph I should use?
- How does analyzing graphs help me better understand data?

Learning Objectives

In this lesson

- Students will select the most appropriate graph to display a set of data.
- Students will construct an appropriate graph to display a set of data.
- Students will analyze data in graphs.

Grade-Level Standards

4.D.2 Ask and answer questions by collecting, organizing, and representing appropriate data.

4.D.2.a Select and make an appropriate graph to display a data set of measurements in fractions of a unit (for example, line plot, bar graph, or double bar graph).

Vocabulary Check-In

Review vocabulary as needed.

Materials List

- Large version of the Our Favorite Foods Table (See Lesson 4 ACCESS Taking the Tally.)
- Unit 11 Lesson 4 Graph Sorting Cards (Photocopy 1 set per student. See the Blackline Master at the end of the volume.)
- Glue
- Scissors
- Rulers (1 per student or enough for one-half of the class)

Photo Credit: Nour Tarta / Shutterstock.com

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Lesson 4

Data About Us

Quick Code:
egmt4189

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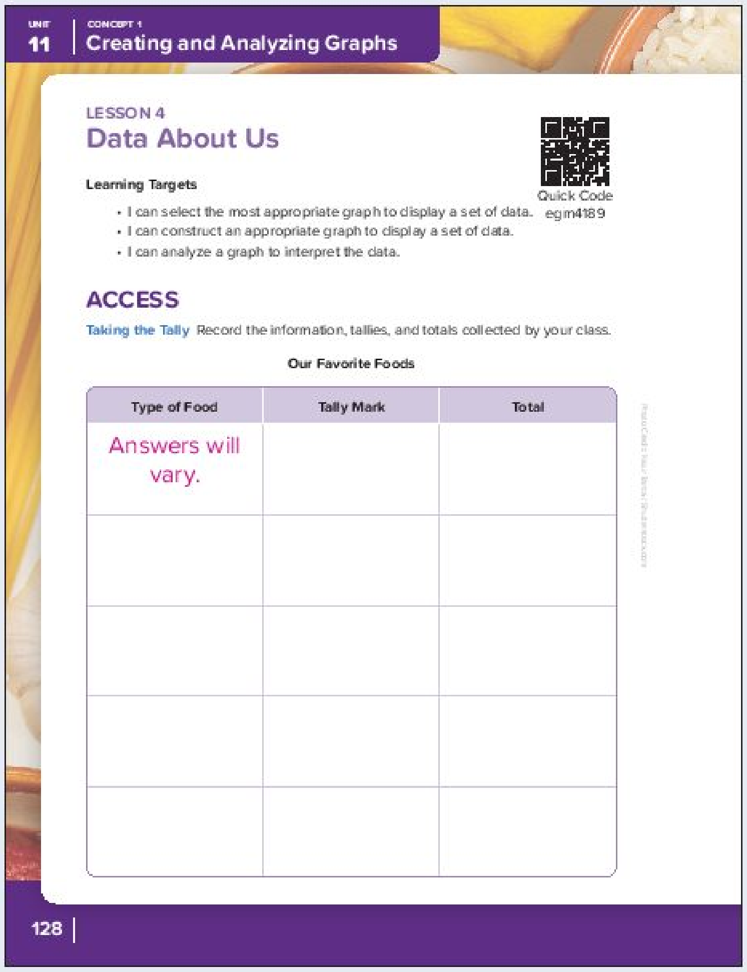
Student Page 128



UNIT 11 | CONCEPT 1 Creating and Analyzing Graphs

LESSON 4

Data About Us

Quick Code
egm4189

Learning Targets

- I can select the most appropriate graph to display a set of data.
- I can construct an appropriate graph to display a set of data.
- I can analyze a graph to interpret the data.

ACCESS

Taking the Tally Record the information, tallies, and totals collected by your class.

Our Favorite Foods

Type of Food	Tally Mark	Total
Answers will vary.		

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ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may struggle to select the appropriate graph for a data set.

Taking the Tally

1. Ask students to talk to their Shoulder Partner about the kinds of data that people collect to represent in graphs.
2. Call on several students to share their thinking. Record their answers on the board.
3. Select three ideas shared by students and ask them to identify what type of graph would be best to use to represent those data.
   Students should suggest bar graphs for categorical data, such as favorite animal or color, with one group surveyed. Students should suggest double bar graphs for categorical data that is broken into two additional sub categories, such as favorite colors between boys and girls. Students should suggest line plots for data involving measurements, such as length of time, distance, height, or weight. However, accept all answers for which students provide valid mathematical reasoning.

4. Tell students that today they will practice collecting and recording their own set of data. Display the large version of the Our Favorite Foods table.

Our Favorite Foods

Type of Food	Tally Mark	Total

5. Use Calling Sticks to choose 5 students to suggest 5 different types of food. Ask students to turn to Lesson 4 ACCESS Taking the Tally and record the foods in the table.
6. Ask volunteers to help you collect and record data. Students should raise their hands to vote for their favorite food on the table. Students may vote only once. The volunteers should help you count and record the totals using tally marks.
7. Give students a minute to copy the data into the table in their Student Materials. Ask students to compare their table with their partner's table to make sure they match.

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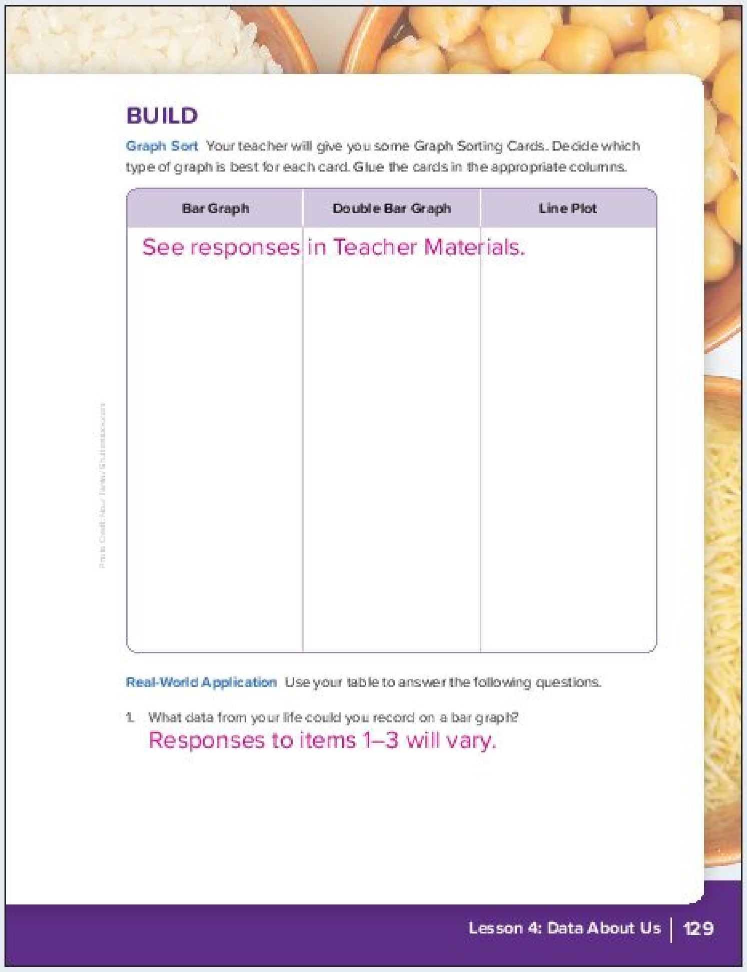
Student Page 129



BUILD

Graph Sort Your teacher will give you some Graph Sorting Cards. Decide which type of graph is best for each card. Glue the cards in the appropriate columns.

Bar Graph	Double Bar Graph	Line Plot
See responses in Teacher Materials.		

Real-World Application Use your table to answer the following questions.

1. What data from your life could you record on a bar graph?

Responses to items 1–3 will vary.

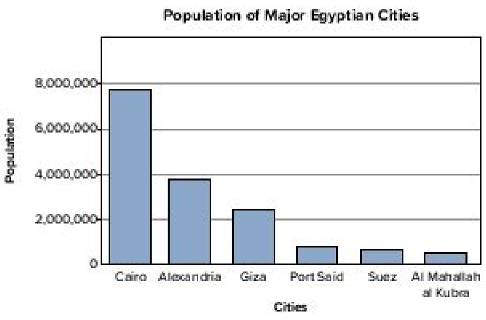
BUILD (40 min)

Graph Sort and Real-World Application (15 min)

1. Direct students to chorally read the Lesson 4 Learning Targets. Ask students to use a Fist-to-Five to self-assess their current level of confidence with meeting the Learning Targets.
2. Divide students into two groups. Group 1 will complete the Graph Sort independently while Group 2 works with the teacher on the Classy Graphs. Tell students that the groups will switch activities after about 15 minutes. Move students to work on their assigned activity.
3. Give students in Group 1 a copy of the Graph Sorting Cards, scissors, and glue. Ask Group 1 students to turn to Lesson 4 BUILD Graph Sort. Instruct them to answer the Real-World Application questions after they finish their sorting activity. Then, begin working with Group 2.

Answer Key for Graph Sort:

Bar Graph



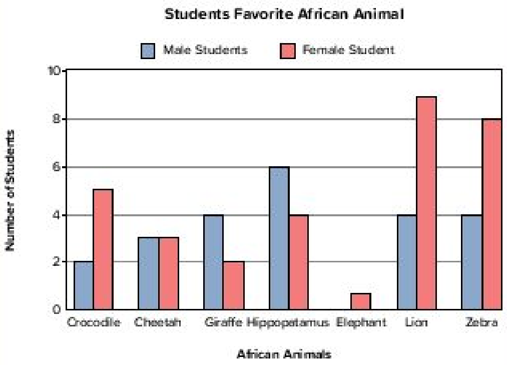
Favorite Season	tally	total
Winter	𝍸 𝍸 𝍷𝍷	12
Spring	𝍸 𝍸 𝍸	15
Summer	𝍷𝍷𝍷	3
Fall	𝍸 𝍸 𝍸 𝍷𝍷	17

This type of graph is used to compare things between different groups or to track change over large periods of time.

Double Bar Graph

This table shows the bike sales for a store during the first 4 months of 2 years.

	January	February	March	April
2020	40	33	56	72
2021	30	23	56	70



This type of graph is used to display two sets of data on the same graph.

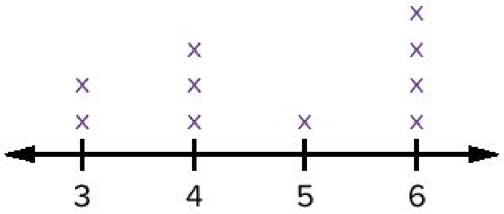
Line Plot

Eight friends made new bracelets their lengths were: 15.5 cm; 20 cm; 15 cm; 20.5 cm; 15.5 cm; 15 cm; 15 cm; 20 cm

How could they represent these data?

Number of Siblings	Tally Marks	Total
0	𝍷	1
1	𝍷𝍷𝍷𝍷	4
2	𝍸	5
3	𝍸 𝍷𝍷	7
4	𝍷𝍷	2
5	𝍷	1

Number of Days Spent at the Beach



This type of graph is used to show the frequency of data on a number line.

Classy Graphs (15 min)

1. Direct Group 2 students to Lesson 4 BUILD Classy Graphs. Ask students to look at the first table. Tell students that they will be voting by raising their hands. Tell students they can vote only once. Ask students to discuss what would happen to the data if they voted more than once.
   Students should see that the data would no longer be a true representation of the group.

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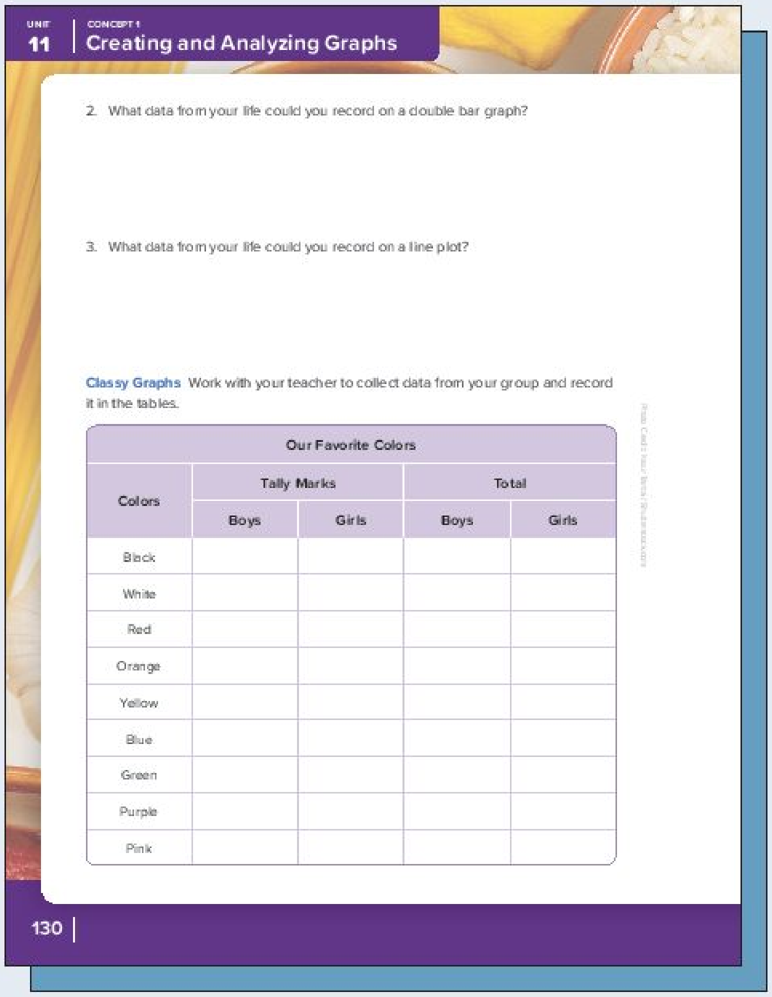
Student Pages 130–132



UNIT 11 | CONCEPT 1 Creating and Analyzing Graphs

2. What data from your life could you record on a double bar graph?

3. What data from your life could you record on a line plot?

Classy Graphs Work with your teacher to collect data from your group and record it in the tables.

Our Favorite Colors				
Colors	Tally Marks		Total	
	Boys	Girls	Boys	Girls
Black				
White				
Red				
Orange				
Yellow				
Blue				
Green				
Purple				
Pink				

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2. Work with students to collect and record favorite colors data for Group 2.
3. Once the data are tallied, ask students to discuss whether they would represent these data in a bar graph, double bar graph, or line plot.
   For the Our Favorite Colors data, a double bar graph would be best because we are displaying two sets of data on one graph. The question is further broken into another subset.
4. Repeat the process for How We Get to School and Number of Siblings.
   For the How We Get to School data, a bar graph would be best because we are comparing the ways students get to school each day.
   For the Number of Siblings data, a line plot would be best because we are collecting data related to numbers.
5. For the Length of Pencil data table, students should measure the length of their pencil to the nearest $\frac{1}{2}$ centimeter. Students should find their pencil measurement in the ranges given in the table. Help students collect and record their pencil measurement data.
6. Ask students to discuss what type of graph they would use to represent the pencil measurement data.
7. After about 15 minutes, switch groups. Give students in Group 2 a copy of the Graph Sorting Cards, scissors, and glue. Ask them to turn to Lesson 4 BUILD Graph Sort. Instruct students to answer the Real-World Application questions after they finish their sorting activity. Work with Group 1 students on the Classy Graph activity.

Let's Regroup (10 min)

1. With 10 minutes left in BUILD, bring Groups 1 and 2 back together. Review the answers to Graph Sort as a class and clear up any confusion.
2. Use Calling Sticks to have students share their responses to the Real-World Application questions.
   Answers will vary.

CONNECT (7 min)

Writing About Math

Direct students to Lesson 4 CONNECT Writing About Math and ask them to respond to the prompt.

WRAP-UP (3 min)

Let’s Chat About Our Learning

Ask volunteers to share their answers to the Writing About Math questions. Encourage students to share their reasoning.

PRACTICE

Direct students to Lesson 4 PRACTICE and have them complete the problems. Address student errors and misconceptions related to graphing data that includes fractions.

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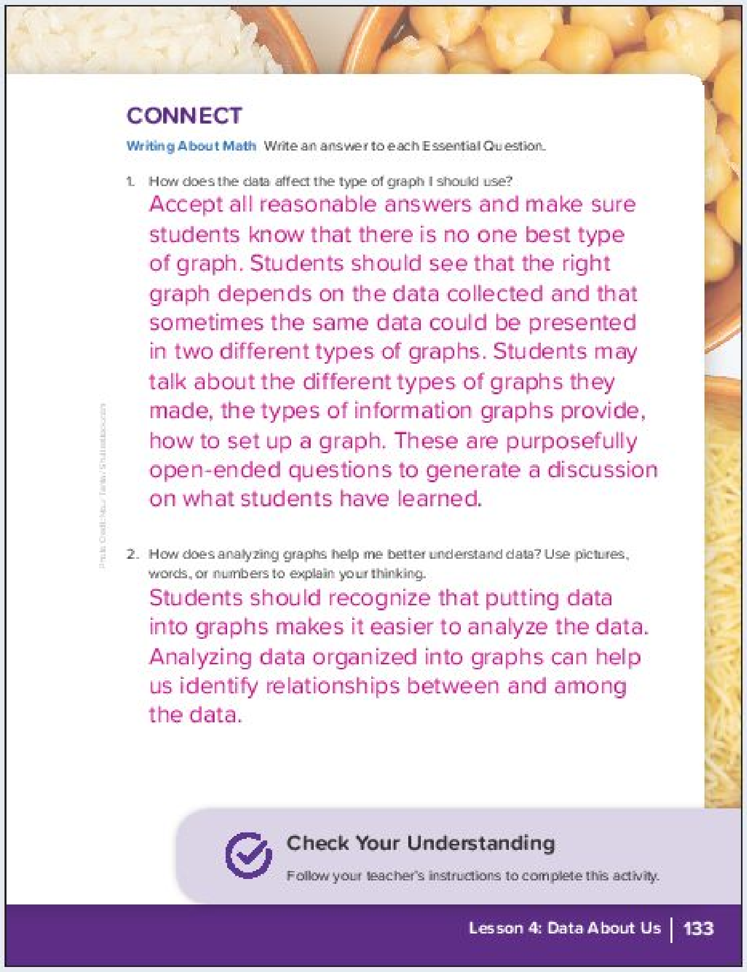
Student Page 133



CONNECT

Writing About Math Write an answer to each Essential Question.

1. How does the data affect the type of graph I should use?

Accept all reasonable answers and make sure students know that there is no one best type of graph. Students should see that the right graph depends on the data collected and that sometimes the same data could be presented in two different types of graphs. Students may talk about the different types of graphs they made, the types of information graphs provide, how to set up a graph. These are purposefully open-ended questions to generate a discussion on what students have learned.

2. How does analyzing graphs help me better understand data? Use pictures, words, or numbers to explain your thinking.

Students should recognize that putting data into graphs makes it easier to analyze the data. Analyzing data organized into graphs can help us identify relationships between and among the data.

Check Your Understanding

Follow your teacher's instructions to complete this activity.

Lesson 4: Data About Us | 133

Check Your Understanding

1. Gamila surveyed her class. She asked them how many hours they spent doing daily chores and then plotted their answers. Use the graph to fill out her table.

Hours Spent Doing Daily Chores

Number of Hours	Tally Marks	Total
0		0
$\frac{1}{2}$	|	1
1	|	1
$1\frac{1}{2}$		0
2	𝍸	5
$2\frac{1}{2}$	|	1
3	𝍸	5
$3\frac{1}{2}$		0
4	||	2
$4\frac{1}{2}$	|	1
5		0

2. Write three statements about the graph.
3. What is one question you could ask about the graph?
4. Write two comparison statements.
5. Use either addition or subtraction to make one statement about the graph.

Answers to Problems 2–5 will vary, but should be mathematically valid and related to the data in the table.

Photo Credit: Nour Tarrar / Shutterstock.com

Materials List

- Crayons, markers, or colored pencils
- Rulers
- Large sheet of plain paper (1 per student)
- Optional: Graph paper (1 per student)

Photo Credit: Nour Tanta / Shutterstock.com

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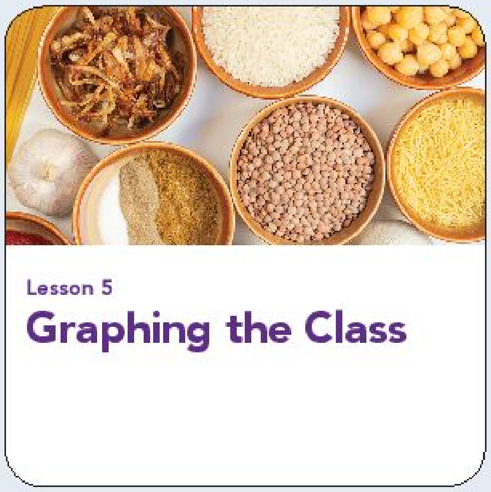


Lesson 5

Graphing the Class

Quick Code:
egmt4190

LESSON 5
Graphing the Class

Lesson Overview

In this lesson, students create a line plot for a set of data and consider how to space the numbers. They then select a data set from their group surveys in Lesson 4 to create a graph that includes all essential elements. Students then write questions about their graphs and answer those written by their partners.

Lesson Essential Questions

- How does the data affect the type of graph I should use?
- How does analyzing graphs help me better understand data?

Learning Objective

In this lesson

- Students will ask and answer questions about fractional data in a graph.

Grade-Level Standards

4.D.2 Ask and answer questions by collecting, organizing, and representing appropriate data.

4.D.2.b Solve problems involving addition and subtraction of fractions by using information presented in graphs (for example, from a line plot find and analyze the difference in height between the tallest and shortest students in the classroom).

Vocabulary Check-In

Review vocabulary as needed.

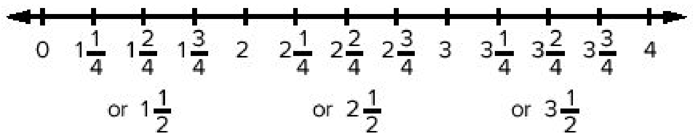
ACCESS (10 min)

COMMON MISCONCEPTIONS AND ERRORS

- Students may struggle to select the appropriate graph for a data set.

Plot it Out

1. Direct students to Lesson 5 ACCESS Plot it Out and chorally read the Learning Target.
2. Ask students to create a line plot for the data set.
3. Ask volunteers to share how they drew their line plot. Draw a number line on the board (as shown) and discuss with students why this number line is correct.



4. Use Calling Sticks to choose students to discuss how they decided on a scale and how they decided where their number line should begin and end. Accept all reasonable answers. Important points include the following: look for the smallest and biggest numbers to see what should be included in the line plot; move up to the next whole number (in this case, the line ends at 4 instead of $3\frac{3}{4}$); determine the smallest fraction to understand how to break up the line plot (in this case, it is broken up into fourths instead of halves).
5. Ask students to brainstorm what the data could represent. Answers will vary but should include something that was measured and could result in fraction data.

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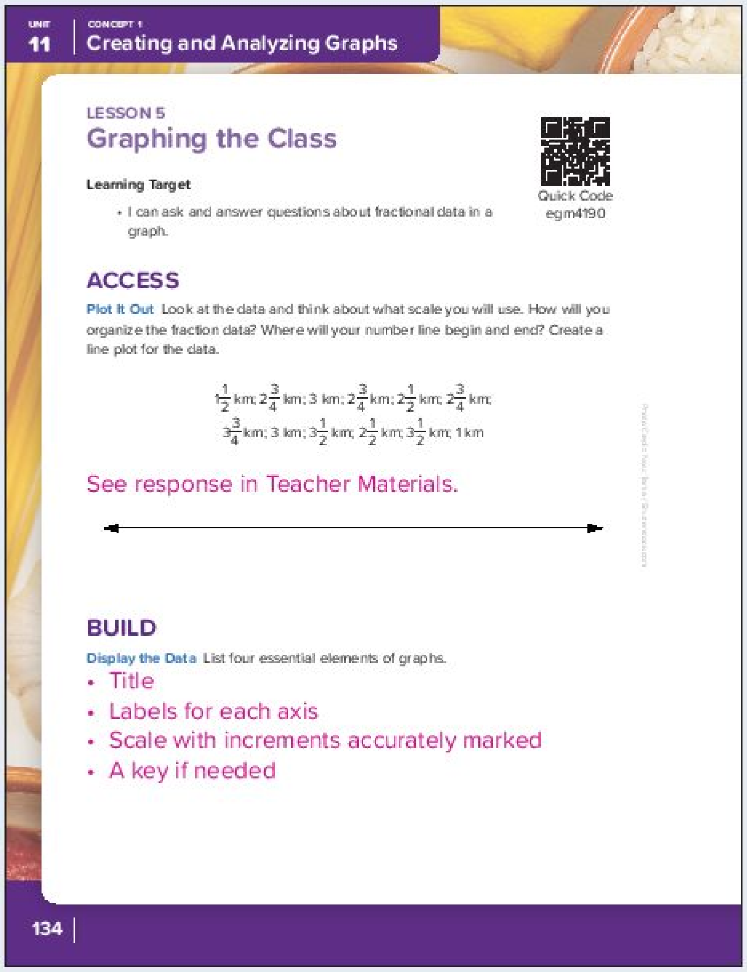
Student Page 134



UNIT 11 | CONCEPT 1 Creating and Analyzing Graphs

LESSON 5

Graphing the Class

Quick Code
egm4190

Learning Target

- I can ask and answer questions about fractional data in a graph.

ACCESS

Plot It Out Look at the data and think about what scale you will use. How will you organize the fraction data? Where will your number line begin and end? Create a line plot for the data.

$1\frac{1}{2}$ km; $2\frac{3}{4}$ km; 3 km; $2\frac{3}{4}$ km; $2\frac{1}{2}$ km; $2\frac{3}{4}$ km;
$3\frac{3}{4}$ km; 3 km; $3\frac{1}{2}$ km; $2\frac{1}{2}$ km; $3\frac{1}{2}$ km; 1 km

See response in Teacher Materials.

BUILD

Display the Data List four essential elements of graphs.

- Title
- Labels for each axis
- Scale with increments accurately marked
- A key if needed

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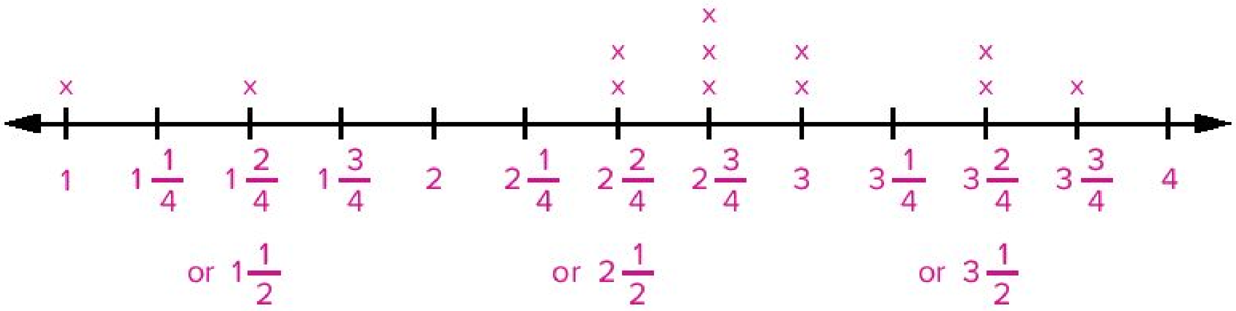
Answer Key for Plot it Out:



BUILD (40 min)

Display the Data (30 min)

1. Tell students that they will make graphs from one of the data sets they collected about their group in the previous lesson. Students may choose the best type of graph for their data.
2. Direct students to Lesson 5 BUILD Display the Data. Ask students to write down all of the elements of a graph.
3. After a couple minutes, review the answers as a class. Record them on the board and make sure that students have a complete list in their Student Materials.
   - Title
   - Labels for each axis
   - Scale with increments accurately marked
   - A key if needed
4. Tell students they can use this information as a checklist they can reference while working. Explain further that there are two additional things to consider when making a graph. They should make sure their data are placed or drawn carefully and accurately and their graph should be clear and legible. If those two things are not done, it will be difficult to analyze and interpret the data.
5. Distribute large pieces of plain and/or graph paper, rulers, and crayons, markers, or colored pencils. Direct students to choose their data set and create their graphs.
6. When 2 minutes are left in the segment, ask students to stop and look over the list to ensure that they have included all the components for a quality bar graph or line plot.

Create Questions (10 min)

Direct students to Lesson 5 BUILD Create Questions. Tell students that they have 10 more minutes to finish their graph and write two questions that can be answered by analyzing the data in their graph.
Students' questions will vary and will depend on the graph they create.

CONNECT (7 min)

Analyze the Data

Ask students to exchange their graphs with their Shoulder Partner. Partners should analyze each other's graphs and answer the questions about the graph. At the end of CONNECT, collect the graphs to check students' work and display in the classroom.

WRAP-UP (3 min)

Let's Chat About Our Learning

Ask students to discuss the following questions:

ASK
- *What is the easiest part of making a graph?*
- *What is the hardest part of making a graph?*
- *What is the easiest part of reading a graph?*
- *What is the hardest part of reading a graph?*

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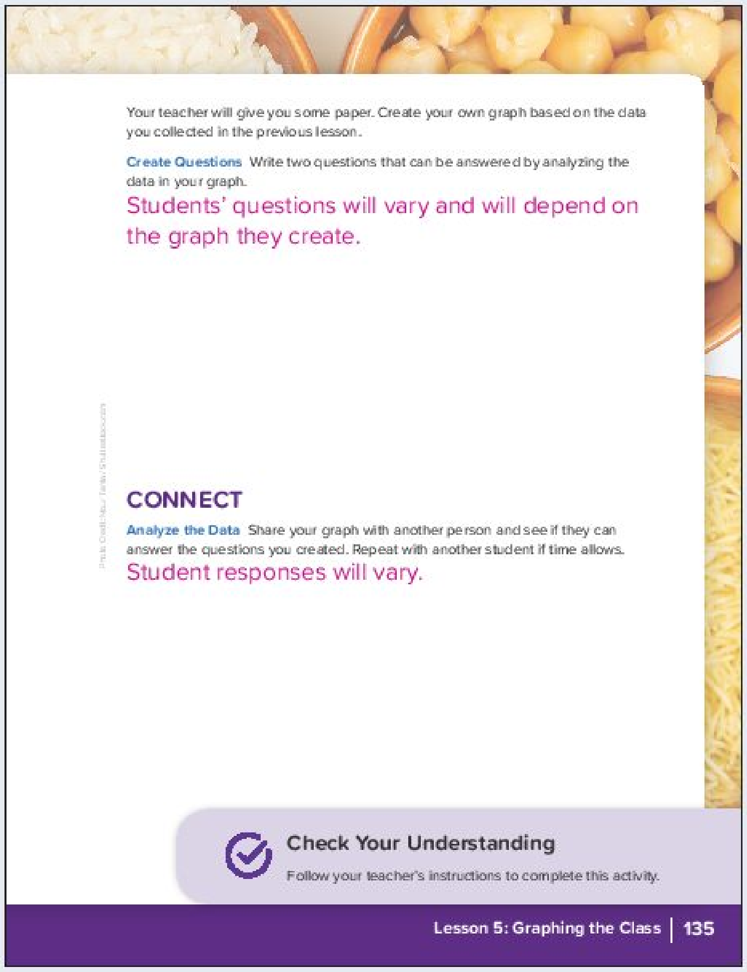
Student Page 135



Your teacher will give you some paper. Create your own graph based on the data you collected in the previous lesson.

Create Questions Write two questions that can be answered by analyzing the data in your graph.

Students' questions will vary and will depend on the graph they create.

CONNECT

Analyze the Data Share your graph with another person and see if they can answer the questions you created. Repeat with another student if time allows.

Student responses will vary.

Check Your Understanding

Follow your teacher's instructions to complete this activity.

Lesson 5: Graphing the Class | 135

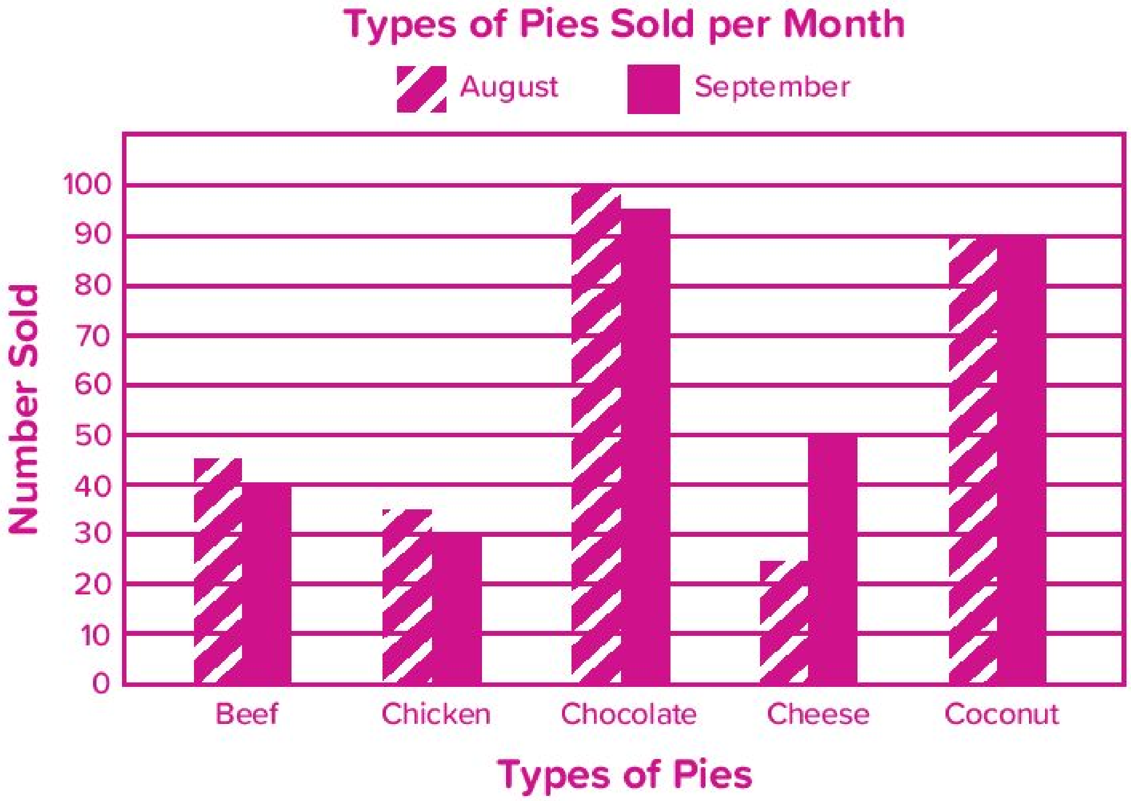
PRACTICE

Direct students to Lesson 5 PRACTICE and have them complete the problems. Address student errors and misconceptions related to graphing and analyzing data that contains fractions.

Check Your Understanding

1. The data set shown here tracks the number and types of pies sold in August and September. Use the data set to create a double bar graph. Remember to use two different colors for your bars and to add a key.

Months	Beef	Chicken	Chocolate	Cheese	Coconut
August	45	35	100	25	90
September	40	30	95	50	90



2. Analyze the data. Write four statements about the data in the double bar graph.
Statements about the double bar graph will vary. Accept all reasonable answers.

Concept Check-In and Remediation

Lesson Overview

In this lesson, students work to correct misconceptions and errors from Concept 1: Creating and Analyzing Graphs. First, administer the Concept Check-In. Once you have reviewed the quiz results, choose remediation activities based on the needs of your students. Some recommendations are listed in the chart, but the needs of your particular students should inform your choices. Students may work independently, in pairs, or in a small group with the teacher.

Concept Essential Questions

- How does the data affect the type of graph I should use?
- How does analyzing graphs help me better understand data?

Learning Objective

In this lesson

- Students will work to correct misconceptions and errors related to creating and analyzing graphs with fraction data.

Grade-Level Standards

4.D.2 Ask and answer questions by collecting, organizing, and representing appropriate data.

4.D.2.a Select and make an appropriate graph to display a data set of measurements in fractions of a unit (for example, line plot, bar graph, or double bar graph).

4.D.2.b Solve problems involving addition and subtraction of fractions by using information presented in graphs (for example, from a line plot find and analyze the difference in height between the tallest and shortest students in the classroom).

Vocabulary Check-In

Review concept vocabulary as needed.

Materials List

- Materials may vary

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DIGITAL

Concept Check-In and Remediation

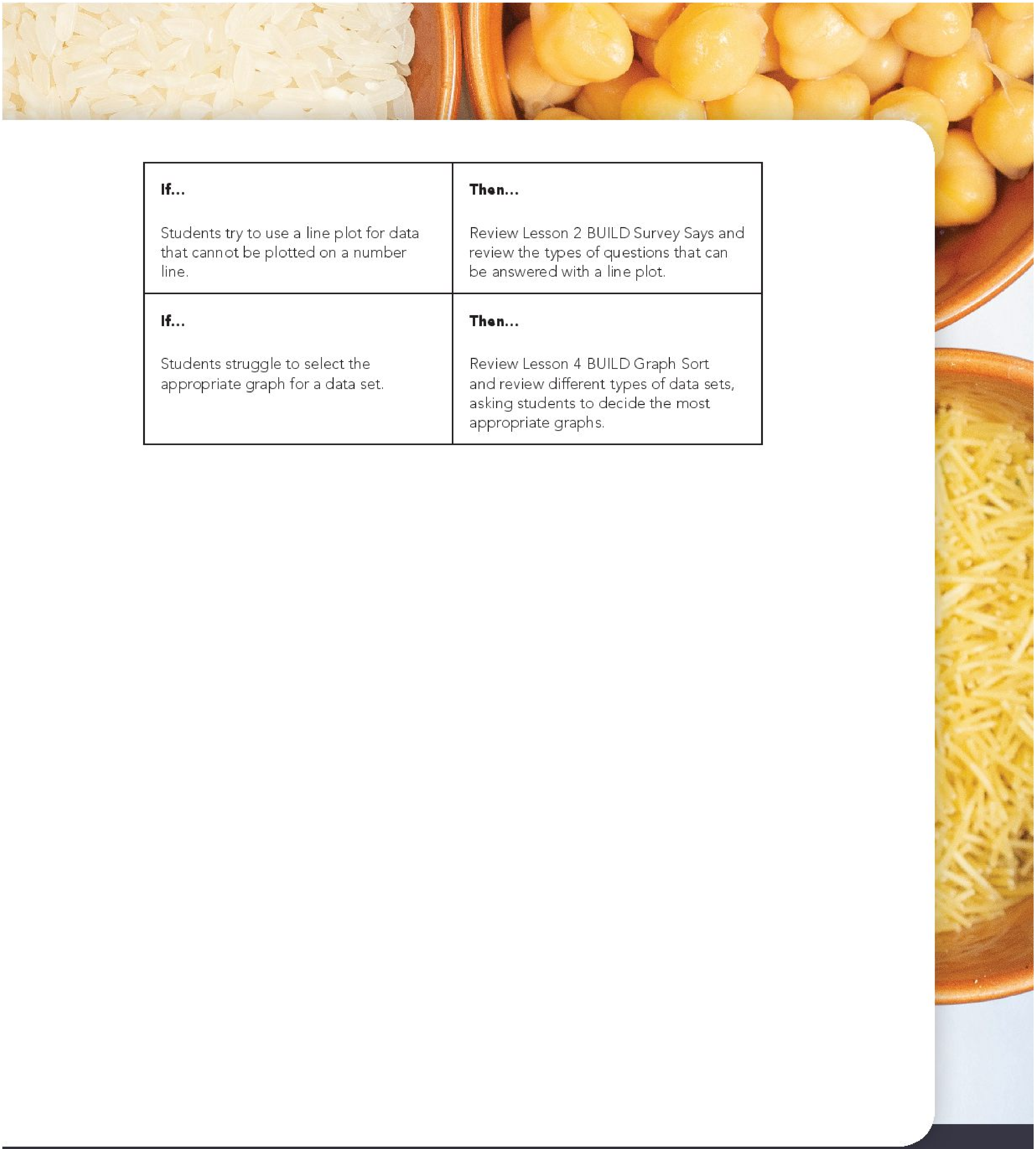
Quick Code:
egmt4191

COMMON MISCONCEPTIONS AND ERRORS

- Students may struggle to understand that intervals on a bar graph are not always single units.
- When the data includes fractional amounts, students may struggle to determine how to label the scale.
- Students may be confused about when to use a single bar graph or a double bar graph. They may not understand that double bar graphs are used to make comparisons between and among sets of data (for example, comparing the desserts favored by boys with the desserts favored by girls). Students may try to use a line plot for data that cannot be plotted on a number line.
- Students may struggle to select the appropriate graph for a data set.

Remediation: Correcting Misconceptions

If... Students struggle to understand that intervals on a bar graph are not always single units or if students struggle to determine the scale when the data includes fractional amounts.	**Then...** Review Lessons 1 and 3. Use a variety of bar graphs that have different intervals, including fractions. Have students state the scale. If necessary, insert tick marks to help students, as in the Ice Cream Double Bar Graph in Lesson 3. Additionally, make sure students begin each scale with 0, and think of skip counting when determining the value of a next interval since the scale is not always in single units or just whole numbers.
If... Students are confused about when to use a single bar graph or a double bar graph.	**Then...** Review Lesson 1 BUILD Single or Double? and ask students more questions of this sort, showing them tables that have categories broken up into two smaller sections. Also, review Lesson 3. Present different sets of data and discuss with students whether or not the data should be represented in a bar graph, double bar graph, or both. Help students see that when the same data are collected for two different groups, a double bar graph might be most appropriate.



If…	Then…
Students try to use a line plot for data that cannot be plotted on a number line.	Review Lesson 2 BUILD Survey Says and review the types of questions that can be answered with a line plot.
If…	**Then…**
Students struggle to select the appropriate graph for a data set.	Review Lesson 4 BUILD Graph Sort and review different types of data sets, asking students to decide the most appropriate graphs.

Primary 4 Resources

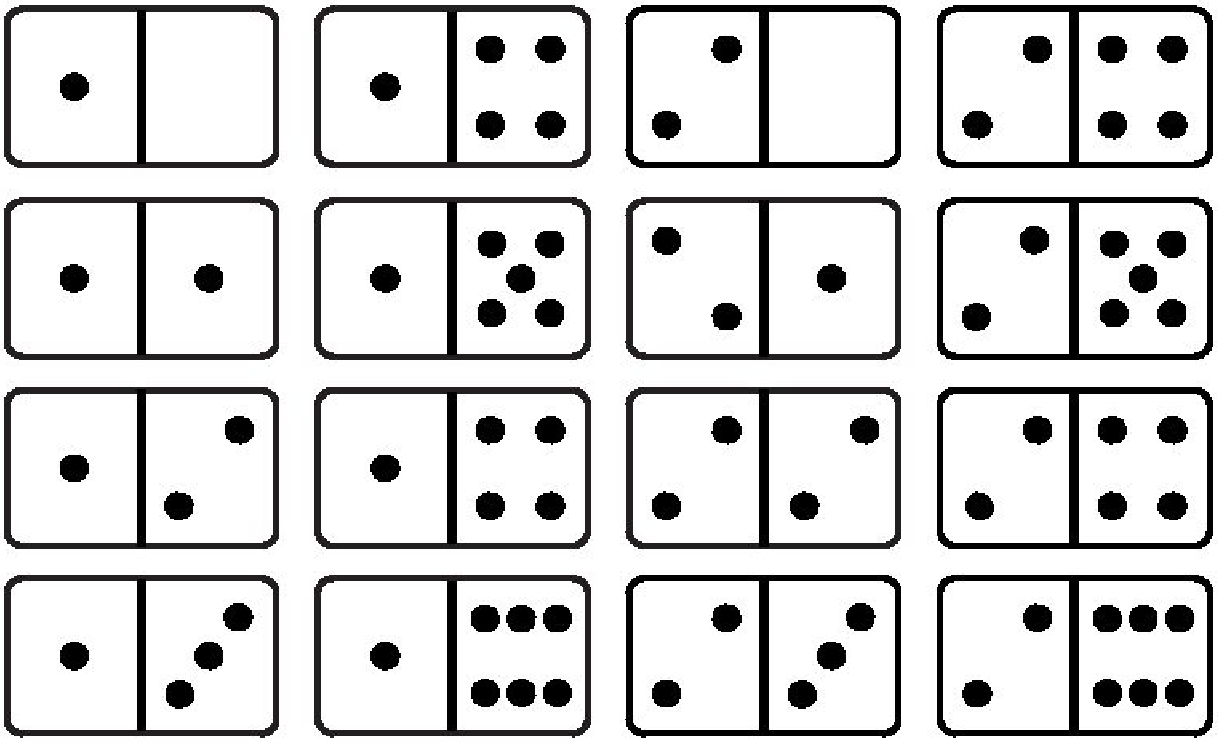
- Lesson Blackline Masters
- Glossary

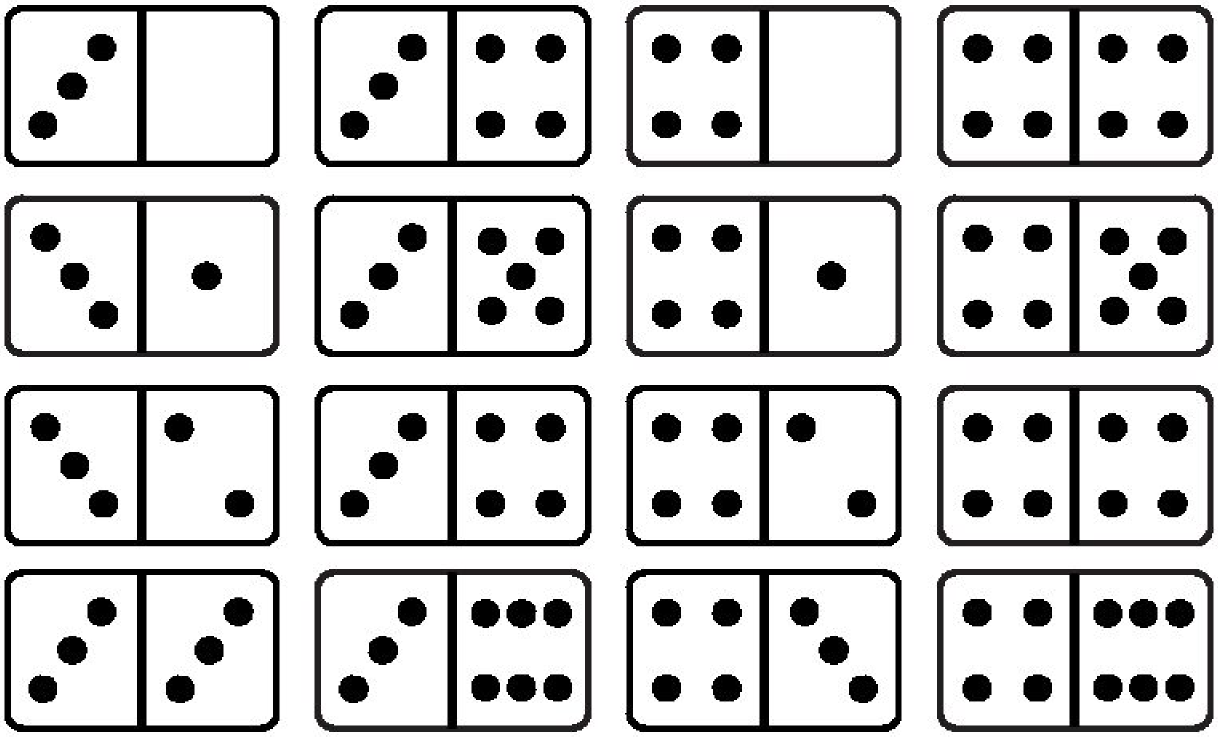
Unit 9, Lesson 2

Break It Down

Dominoes

Instructions: Photocopy and cut apart.

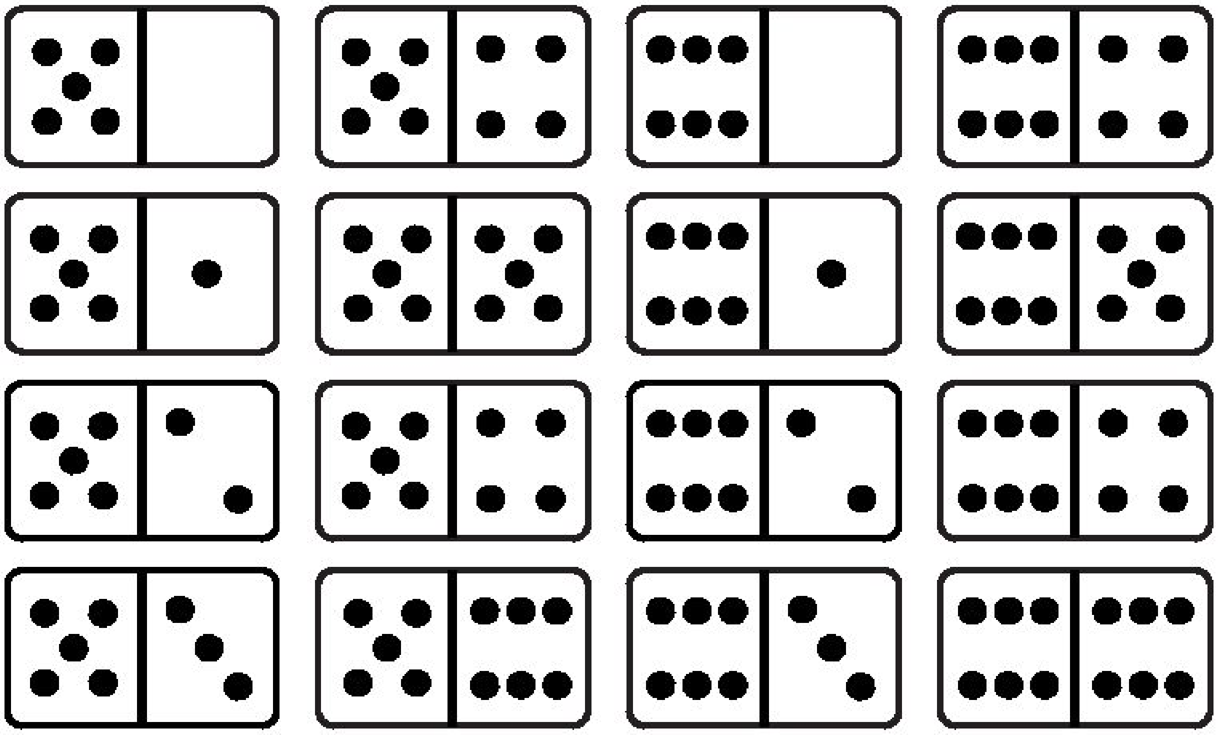




Unit 9, Lesson 2
Break It Down

Dominoes, *continued*

Instructions: Photocopy and cut apart.



Unit 9, Lesson 3

Break It Down Again

Decompose It — I Have . . . Who has?

Instructions: Photocopy and cut apart.

★ I have $\frac{3}{11} + \frac{2}{11} + \frac{4}{11}$. Who has an expression with a value of $\frac{4}{5}$?	I have $\frac{1}{5} + \frac{2}{5} + \frac{1}{5}$. Who has an expression with a value of $\frac{7}{10}$?	I have $\frac{3}{10} + \frac{3}{10} + \frac{1}{10}$. Who has an expression with a value of $\frac{3}{4}$?
I have $\frac{1}{4} + \frac{2}{4}$. Who has an expression with a value of $\frac{5}{12}$?	I have $\frac{1}{12} + \frac{3}{12} + \frac{1}{12}$. Who has an expression with a value of $\frac{5}{8}$?	I have $\frac{2}{8} + \frac{3}{8}$. Who has an expression with a value of $\frac{8}{10}$?
I have $\frac{2}{10} + \frac{2}{10} + \frac{2}{10} + \frac{2}{10}$. Who has an expression with a value of $\frac{6}{6}$?	I have $\frac{1}{6} + \frac{3}{6} + \frac{2}{6}$. Who has an expression with a value of $\frac{5}{10}$?	I have $\frac{2}{10} + \frac{3}{10}$. Who has an expression with a value of $\frac{9}{12}$?
I have $\frac{3}{12} + \frac{3}{12} + \frac{3}{12}$. Who has an expression with a value of $\frac{5}{6}$?	I have $\frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{2}{6}$. Who has an expression with a value of $\frac{8}{8}$?	I have $\frac{3}{8} + \frac{4}{8} + \frac{1}{8}$. Who has an expression with a value of $\frac{2}{6}$?
I have $\frac{1}{6} + \frac{1}{6}$. Who has an expression with a value of $\frac{5}{13}$?	I have $\frac{2}{13} + \frac{1}{13} + \frac{2}{13}$. Who has an expression with a value of $\frac{6}{10}$?	I have $\frac{1}{10} + \frac{2}{10} + \frac{2}{10} + \frac{1}{10}$. Who has an expression with a value of $\frac{3}{3}$?

Unit 9, Lesson 3

Break It Down Again

Decompose It — I Have . . . Who has?, *continued*

Instructions: Photocopy and cut apart.

I have $\frac{1}{3} + \frac{2}{3}$. Who has an expression with a value of $\frac{11}{12}$?	I have $\frac{6}{12} + \frac{5}{12}$. Who has an expression with a value of $\frac{8}{14}$?	I have $\frac{4}{14} + \frac{1}{14} + \frac{3}{14}$. Who has an expression with a value of $\frac{3}{8}$?
I have $\frac{1}{8} + \frac{2}{8}$. Who has an expression with a value of $\frac{4}{6}$?	I have $\frac{2}{6} + \frac{2}{6}$. Who has an expression with a value of $\frac{7}{8}$?	I have $\frac{2}{8} + \frac{2}{8} + \frac{2}{8} + \frac{1}{8}$. Who has an expression with a value of $\frac{5}{15}$?
I have $\frac{2}{15} + \frac{3}{15}$. Who has an expression with a value of $\frac{9}{10}$?	I have $\frac{1}{10} + \frac{5}{10} + \frac{3}{10}$. Who has an expression with a value of $\frac{6}{12}$?	I have $\frac{2}{12} + \frac{3}{12} + \frac{1}{12}$. Who has an expression with a value of $\frac{5}{9}$?
I have $\frac{2}{9} + \frac{3}{9}$. Who has an expression with a value of $\frac{3}{5}$?	I have $\frac{1}{5} + \frac{1}{5} + \frac{1}{5}$. Who has an expression with a value of $\frac{7}{12}$?	I have $\frac{2}{12} + \frac{2}{12} + \frac{2}{12} + \frac{1}{12}$. Who has an expression with a value of $\frac{4}{7}$?
I have $\frac{2}{7} + \frac{1}{7} + \frac{1}{7}$. Who has an expression with a value of $\frac{8}{12}$?	I have $\frac{1}{12} + \frac{5}{12} + \frac{2}{12}$. Who has an expression with a value of $\frac{15}{20}$?	I have $\frac{5}{20} + \frac{3}{20} + \frac{7}{20}$. Who has an expression with a value of $\frac{9}{11}$?

Unit 9, Lesson 3
Break It Down Again

Decompose It — I Have . . . Who has?, *continued*

Answer Key: The game begins and ends with the card with the star.

1. I have $\frac{3}{11}+\frac{2}{11}+\frac{4}{11}$. ★ Who has an expression with a value of $\frac{4}{5}$?	10. I have $\frac{3}{12}+\frac{3}{12}+\frac{1}{12}$. Who has an expression with a value of $\frac{5}{6}$?
2. I have $\frac{1}{5}+\frac{2}{5}+\frac{1}{5}$. Who has an expression with a value of $\frac{7}{10}$?	11. I have $\frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{2}{6}$. Who has an expression with a value of $\frac{8}{8}$?
3. I have $\frac{3}{10}+\frac{3}{10}+\frac{1}{10}$. Who has an expression with a value of $\frac{3}{4}$?	12. I have $\frac{3}{8}+\frac{4}{8}+\frac{1}{8}$. Who has an expression with a value of $\frac{2}{6}$?
4. I have $\frac{1}{4}+\frac{2}{4}$. Who has an expression with a value of $\frac{5}{12}$?	13. I have $\frac{1}{6}+\frac{1}{6}$. Who has an expression with a value of $\frac{5}{13}$?
5. I have $\frac{1}{12}+\frac{3}{12}+\frac{1}{12}$. Who has an expression with a value of $\frac{5}{8}$?	14. I have $\frac{2}{13}+\frac{1}{13}+\frac{2}{13}$. Who has an expression with a value of $\frac{6}{10}$?
6. I have $\frac{2}{8}+\frac{3}{8}$. Who has an expression with a value of $\frac{8}{10}$?	15. I have $\frac{2}{10}+\frac{2}{10}+\frac{2}{10}+\frac{2}{10}$. Who has an expression with a value of $\frac{6}{6}$?
7. I have $\frac{2}{10}+\frac{2}{10}+\frac{2}{10}+\frac{2}{10}$. Who has an expression with a value of $\frac{6}{6}$?	16. I have $\frac{1}{3}+\frac{2}{3}$. Who has an expression with a value of $\frac{11}{12}$?
8. I have $\frac{1}{6}+\frac{3}{6}+\frac{2}{6}$. Who has an expression with a value of $\frac{5}{10}$?	17. I have $\frac{6}{12}+\frac{5}{12}$. Who has an expression with a value of $\frac{8}{14}$?
9. I have $\frac{2}{10}+\frac{3}{10}$. Who has an expression with a value of $\frac{9}{12}$?	18. I have $\frac{4}{14}+\frac{1}{14}+\frac{3}{14}$. Who has an expression with a value of $\frac{3}{8}$?

Unit 9, Lesson 3
Break It Down Again

Decompose It — I Have . . . Who has?, *continued*

Answer Key: The game begins and ends with the card with the star.

19. I have $\frac{1}{8}+\frac{2}{8}$.
Who has an expression with a value of $\frac{4}{6}$?

20. I have $\frac{2}{6}+\frac{2}{6}$.
Who has an expression with a value of $\frac{7}{8}$?

21. I have $\frac{2}{8}+\frac{2}{8}+\frac{2}{8}+\frac{1}{8}$.
Who has an expression with a value of $\frac{5}{15}$?

22. I have $\frac{2}{15}+\frac{3}{15}$.
Who has an expression with a value of $\frac{9}{10}$?

23. I have $\frac{1}{10}+\frac{5}{10}+\frac{3}{10}$.
Who has an expression with a value of $\frac{6}{12}$?

24. I have $\frac{2}{12}+\frac{3}{12}+\frac{1}{12}$.
Who has an expression with a value of $\frac{5}{9}$?

25. I have $\frac{2}{9}+\frac{3}{9}$.
Who has an expression with a value of $\frac{3}{5}$?

26. I have $\frac{1}{5}+\frac{1}{5}+\frac{1}{5}$.
Who has an expression with a value of $\frac{7}{12}$?

27. I have $\frac{2}{12}+\frac{2}{12}+\frac{2}{12}+\frac{1}{12}$.
Who has an expression with a value of $\frac{4}{7}$?

28. I have $\frac{2}{7}+\frac{1}{7}+\frac{1}{7}$.
Who has an expression with a value of $\frac{8}{12}$?

29. I have $\frac{1}{12}+\frac{5}{12}+\frac{2}{12}$.
Who has an expression with a value of $\frac{15}{20}$?

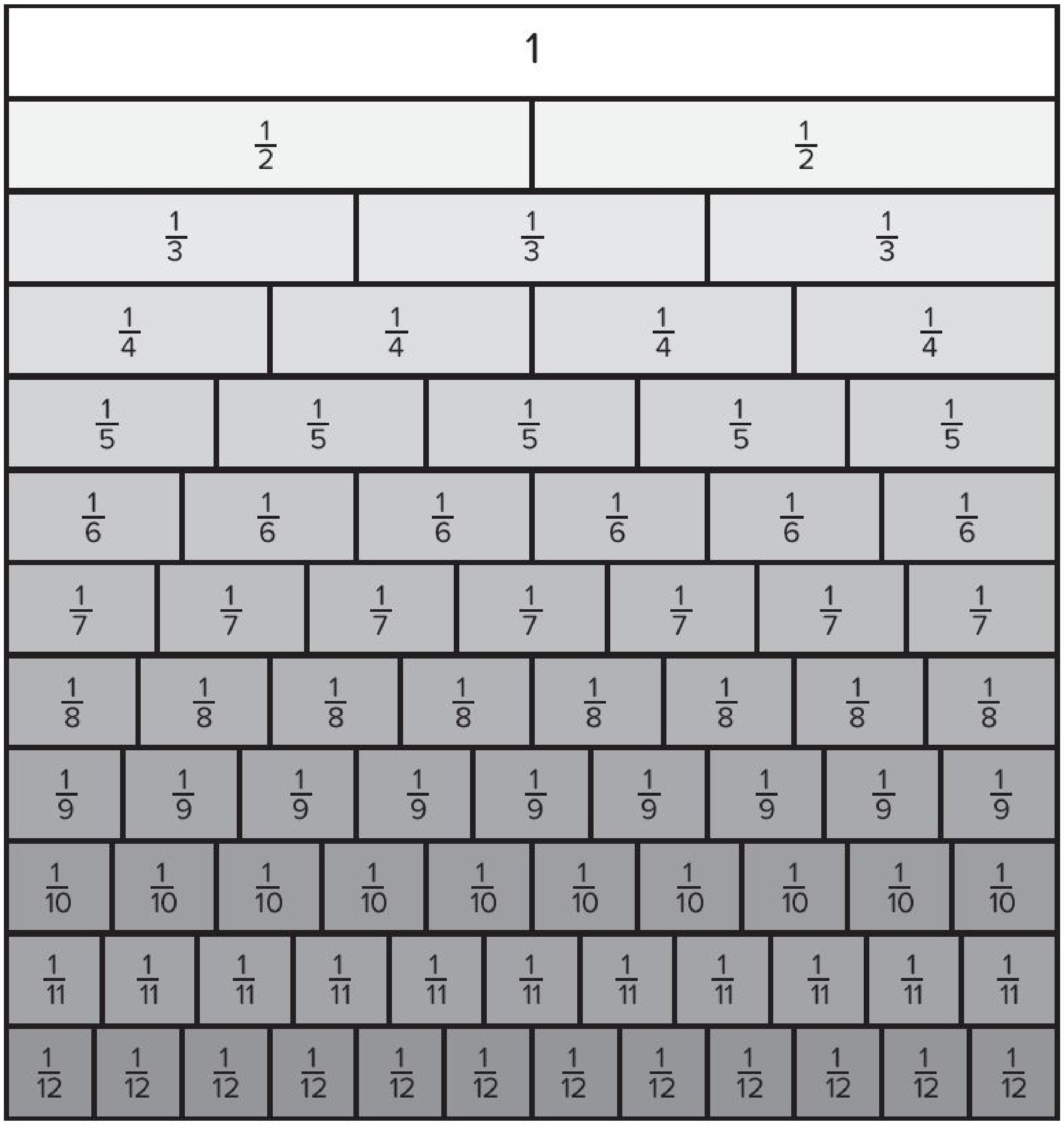
30. I have $\frac{5}{20}+\frac{3}{20}+\frac{7}{20}$.
Who has an expression with a value of $\frac{9}{11}$?

Unit 9, Lesson 10

Same Fraction, Different Day

Fraction Wall

Instructions: Create a large version to display in the classroom.


1
1/2 1/2
1/3 1/3 1/3
1/4 1/4 1/4 1/4
1/5 1/5 1/5 1/5 1/5
1/6 1/6 1/6 1/6 1/6 1/6
1/7 1/7 1/7 1/7 1/7 1/7 1/7
1/8 1/8 1/8 1/8 1/8 1/8 1/8 1/8
1/9 1/9 1/9 1/9 1/9 1/9 1/9 1/9 1/9
1/10 1/10 1/10 1/10 1/10 1/10 1/10 1/10 1/10 1/10
1/11 1/11 1/11 1/11 1/11 1/11 1/11 1/11 1/11 1/11 1/11
1/12 1/12 1/12 1/12 1/12 1/12 1/12 1/12 1/12 1/12 1/12 1/12

Unit 9, Lesson 11
Benchmark Fractions

Mixed Up Fraction Cards

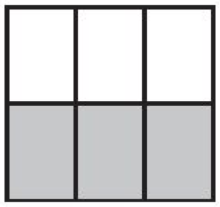
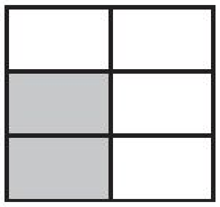
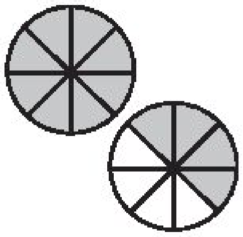
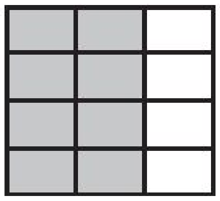
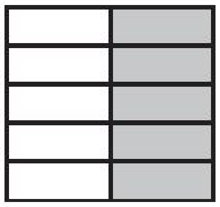
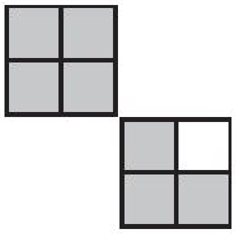
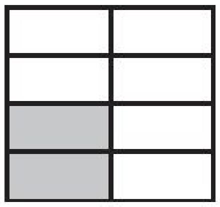
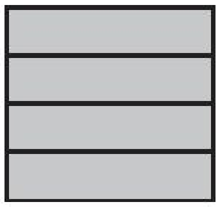
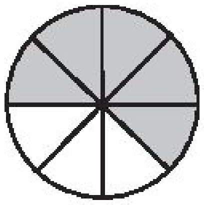
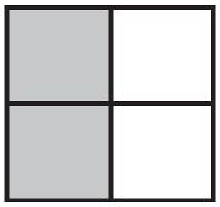
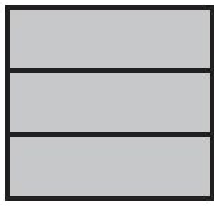
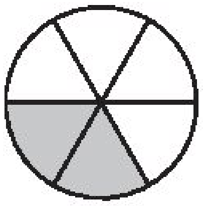
Instructions: Photocopy and cut apart. Each pair of students needs one deck of the three sets.

$\frac{3}{6}$	$\frac{3}{8}$	$\frac{3}{10}$
$\frac{6}{12}$	$\frac{5}{6}$	$\frac{16}{8}$
$\frac{2}{2}$	$\frac{3}{3}$	$\frac{5}{5}$
$\frac{12}{6}$	$1\frac{4}{8}$	$\frac{1}{8}$

Unit 9, Lesson 11
Benchmark Fractions

Mixed Up Fraction Cards, *continued*

Instructions: Photocopy and cut apart. Each pair of students needs one deck of the three sets.

Unit 9, Lesson 11

Benchmark Fractions

Mixed Up Fraction Cards, *continued*

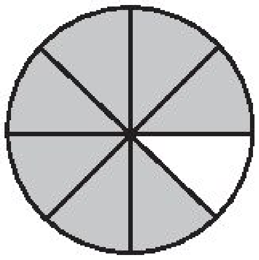
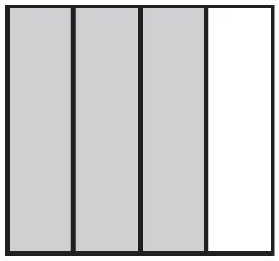
Instructions: Photocopy and cut apart. Each pair of students needs one deck of the three sets.

$\frac{2}{4}$	$\frac{0}{4}$	$\frac{2}{6}$
$\frac{5}{10}$	$\frac{3}{4}$	$\frac{0}{8}$
$\frac{3}{3}$	$\frac{4}{4}$	$\frac{5}{4}$
$\frac{12}{8}$	$1\frac{0}{6}$	$\frac{4}{8}$

Unit 9, Lesson 16
Multiplying by a Whole

Puzzle Mania Cards

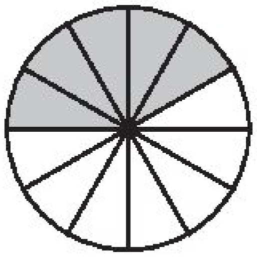
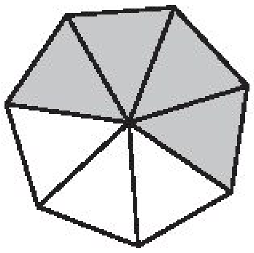
Instructions: Photocopy and cut apart.

$\frac{7}{8}$	$\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}$
$7 \times \frac{1}{8}$	
$\frac{3}{4}$	$\frac{1}{4}+\frac{1}{4}+\frac{1}{4}$
$\frac{1}{4} \times 3$	

Unit 9, Lesson 16
Multiplying by a Whole

Puzzle Mania Cards, *continued*

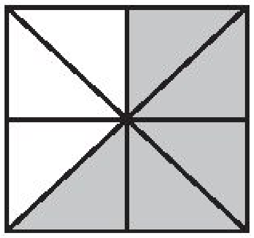
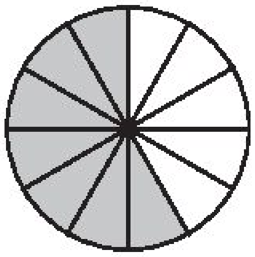
Instructions: Photocopy and cut apart.

$\frac{5}{12}$	$\frac{1}{12}+\frac{1}{12}+\frac{1}{12}+\frac{1}{12}+\frac{1}{12}$
$\frac{1}{12}\times 5$	
$\frac{4}{7}$	$\frac{1}{7}+\frac{1}{7}+\frac{1}{7}+\frac{1}{7}$
$\frac{1}{7}\times 4$	

Unit 9, Lesson 16
Multiplying by a Whole

Puzzle Mania Cards, *continued*

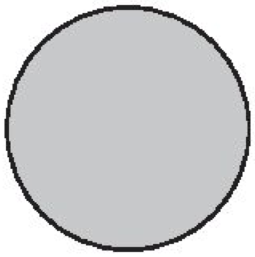
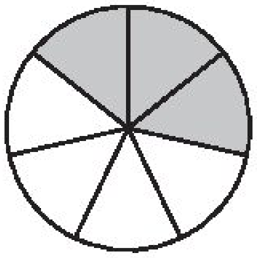
Instructions: Photocopy and cut apart.

$\frac{5}{8}$	$\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}$
$\frac{1}{8} \times 5$	
$\frac{7}{12}$	$\frac{1}{12}+\frac{1}{12}+\frac{1}{12}+\frac{1}{12}+\frac{1}{12}+\frac{1}{12}+\frac{1}{12}$
$\frac{1}{12} \times 7$	

Unit 9, Lesson 16
Multiplying by a Whole

Puzzle Mania Cards, *continued*

Instructions: Photocopy and cut apart.

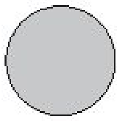
$\frac{4}{4}$	$\frac{1}{4}+\frac{1}{4}+\frac{1}{4}+\frac{1}{4}$
$\frac{1}{4} \times 4$	
$\frac{3}{7}$	$\frac{1}{7}+\frac{1}{7}+\frac{1}{7}$
$3 \times \frac{1}{7}$	

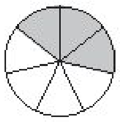
Unit 9, Lesson 16

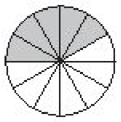
Multiplying by a Whole

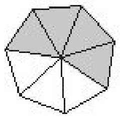
Puzzle Mania Cards, *continued*

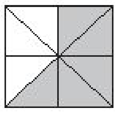
Answer Key

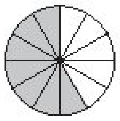
$\frac{4}{4}$	$\frac{1}{4}+\frac{1}{4}+\frac{1}{4}+\frac{1}{4}$
$\frac{1}{4} \times 4$	

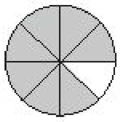
$\frac{3}{7}$	$\frac{1}{7}+\frac{1}{7}+\frac{1}{7}$
$3 \times \frac{1}{7}$	

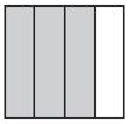
$\frac{5}{12}$	$\frac{1}{12}+\frac{1}{12}+\frac{1}{12}+$ $\frac{1}{12}+\frac{1}{12}$
$\frac{1}{12} \times 5$	

$\frac{4}{7}$	$\frac{1}{7}+\frac{1}{7}+\frac{1}{7}+\frac{1}{7}$
$\frac{1}{7} \times 4$	

$\frac{5}{8}$	$\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+$ $\frac{1}{8}+\frac{1}{8}$
$\frac{1}{8} \times 5$	

$\frac{7}{12}$	$\frac{1}{12}+\frac{1}{12}+\frac{1}{12}+\frac{1}{12}+$ $\frac{1}{12}+\frac{1}{12}+\frac{1}{12}$
$\frac{1}{12} \times 7$	

$\frac{7}{8}$	$\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+$ $\frac{1}{8}+\frac{1}{8}+\frac{1}{8}$
$7 \times \frac{1}{8}$	

$\frac{3}{4}$	$\frac{1}{4}+\frac{1}{4}+\frac{1}{4}$
$\frac{1}{4} \times 3$	

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Unit 9, Lesson 17
Real-World Fraction Connections

Find Your Match Cards

Instructions: Photocopy and cut apart.

Laila ate $\frac{3}{8}$ of a chocolate bar. Then she ate $\frac{2}{8}$ more of her chocolate bar. What fraction of Laila's chocolate bar did she eat? **A**	Hashem is kicking the soccer ball into the goal. He has a total of 8 shots. if he misses 3 of those shots, how many shots did he make? Write your answer as a fraction. **B**
Mona collects beads. In her collection, $\frac{2}{16}$ of the beads are blue, $\frac{6}{16}$ of the beads are red, $\frac{3}{16}$ of the beads are yellow, and $\frac{5}{16}$ of the beads are green. What fraction of her beads are blue, yellow, and green? **A**	Maher loves apple pie. On Monday he ate $\frac{4}{16}$ of the pie and on Tuesday he ate $\frac{2}{16}$ of the pie. How much pie was leftover? **B**
Saeed loves to walk his dog. If he walks his dog $\frac{1}{12}$ km on Monday and $\frac{4}{12}$ km on Tuesday, how far does he walk on both Monday and Tuesday? **A**	Nadia made cinnamon rolls and cut the dough into 12 equal pieces. If she and her family eat $\frac{7}{12}$ of them, what fraction of the cinnamon rolls are left? **B**

Unit 9, Lesson 17

Real-World Fraction Connections

Find Your Match Cards, *continued*

Instructions: Photocopy and cut apart.

Norin, Rami, and Salah were swimming laps. Norin swam $1\frac{8}{16}$ km, Rami swam $\frac{14}{16}$ km, and Salah swam $\frac{9}{16}$ km. How many kilometers did they swim all together? **A**	Tarek and his brother were flying paper airplanes. Tarek threw his plane and it landed 5 meters away. His brother threw his plane and it landed $2\frac{1}{16}$ meters away. How much farther away did Tarek's airplane land? **B**
Zeina's art craft directions say to cut a string that measures $\frac{1}{10}$ of a meter long. She has to cut 5 strings of the same size. What length of string does Zeina need for her art project? **A**	Shehab took a survey about his friends' favorite colors out of blue, red, yellow and green. $\frac{3}{20}$ said blue was their favorite color, $\frac{5}{20}$ said red was their favorite color, and $\frac{2}{20}$ said yellow was their favorite color. How many friends said green was their favorite color? **B**

Unit 9, Lesson 17
Real-World Fraction Connections

Find Your Match Cards, *continued*

Answer Key

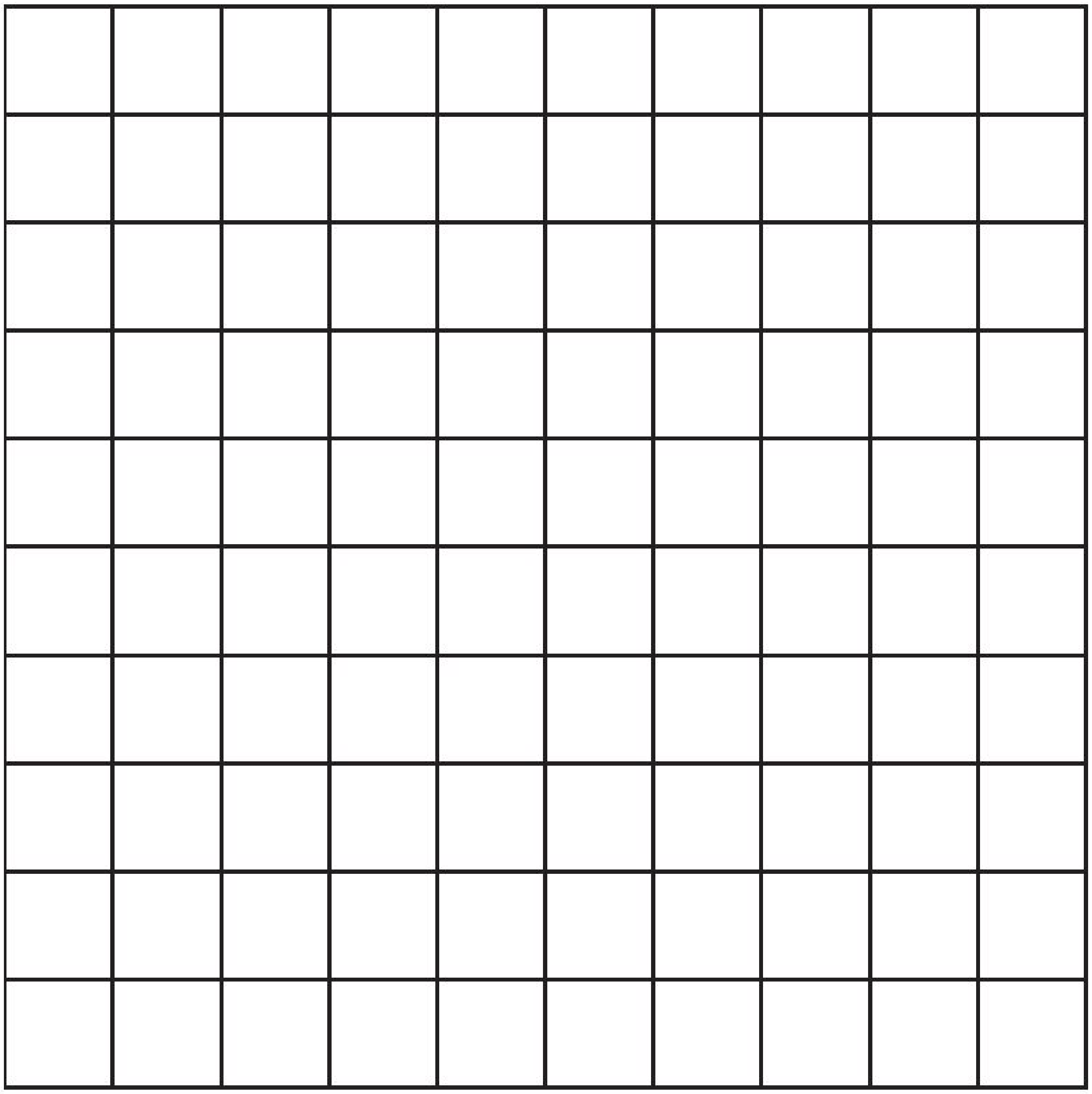
Laila ate $\frac{3}{8}$ of a chocolate bar. Then she ate $\frac{2}{8}$ more of her chocolate bar. What fraction of Laila's chocolate bar did she eat? **A**	Hashem is kicking the soccer ball into the goal. He has a total of 8 shots. if he misses 3 of those shots, how many shots did he make? Write your answer as a fraction. **B**	Laila = $\frac{5}{8}$; Hashem = $\frac{5}{8}$
Mona collects beads. In her collection, $\frac{2}{16}$ of the beads are blue, $\frac{6}{16}$ of the beads are red, $\frac{3}{16}$ of the beads are yellow, and $\frac{5}{16}$ of the beads are green. What fraction of her beads are blue, yellow, and green? **A**	Maher loves apple pie. On Monday he ate $\frac{4}{16}$ of the pie and on Tuesday he ate $\frac{2}{16}$ of the pie. How much pie was leftover? **B**	Mona = $\frac{10}{16}$; Maher = $\frac{10}{16}$
Saeed loves to walk his dog. If he walks his dog $\frac{1}{12}$ km on Monday and $\frac{4}{12}$ km on Tuesday, how far does he walk on both Monday and Tuesday? **A**	Nadia made cinnamon rolls and cut the dough into 12 equal pieces. If she and her family eat $\frac{7}{12}$ of them, what fraction of the cinnamon rolls are left? **B**	Saeed = $\frac{5}{12}$; Nadia = $\frac{5}{12}$
Norin, Rami, and Salah were swimming laps. Norin swam $1\frac{8}{16}$ km, Rami swam $\frac{14}{16}$ km, and Salah swam $\frac{9}{16}$ km. How many kilometers did they swim all together? **A**	Tarek and his brother were flying paper airplanes. Tarek threw his plane and it landed 5 meters away. His brother threw his plane and it landed $2\frac{1}{16}$ meters away. How much farther away did Tarek's airplane land? **B**	Norin = $\frac{15}{16}$; Tarek = $\frac{15}{16}$
Zeina's art craft directions say to cut a string that measures $\frac{1}{10}$ of a meter long. She has to cut 5 strings of the same size. What length of string does Zeina need for her art project? **A**	Shehab took a survey about his friends' favorite colors out of blue, red, yellow and green. $\frac{3}{20}$ said blue was their favorite color, $\frac{5}{20}$ said red was their favorite color, and $\frac{2}{20}$ said yellow was their favorite color. How many friends said green was their favorite color? **B**	Zeina = $\frac{5}{10}$; Shehab = $\frac{10}{20}$ (These problems may not initially appear to be the same, but when simplified they both are equivalent to $\frac{1}{2}$).

Unit 10, Lesson 2

The Powerful 10

Hundredths Grid Model

Instructions: Make multiple copies. You will use the grid to model decimal numbers.

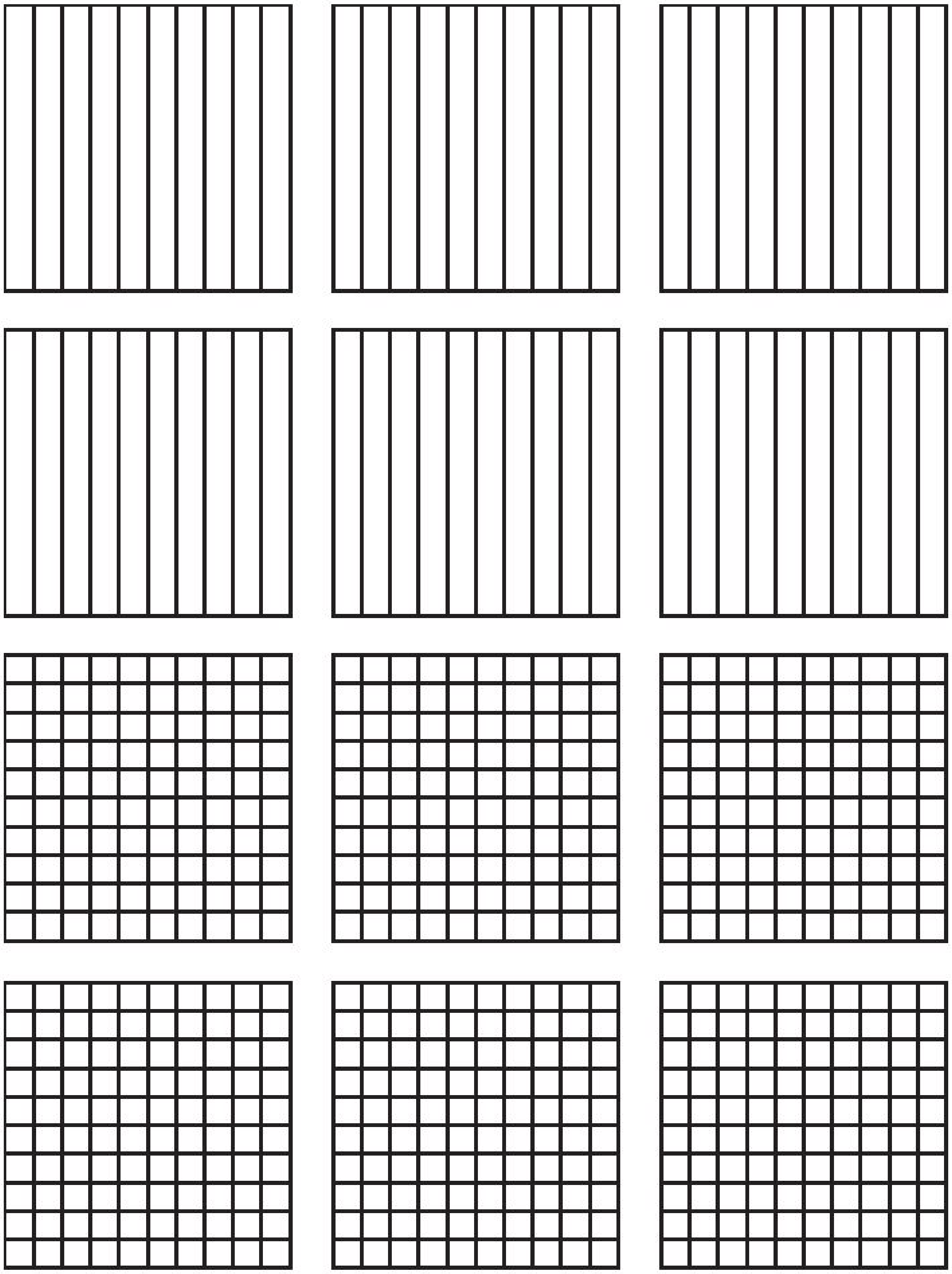


Unit 10, Lesson 2

The Powerful 10

Tenths and Hundredths Models

Instructions: Photocopy and cut apart.

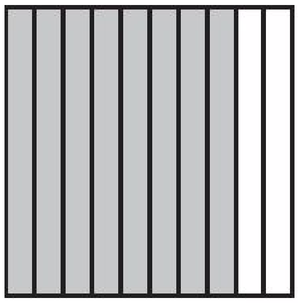
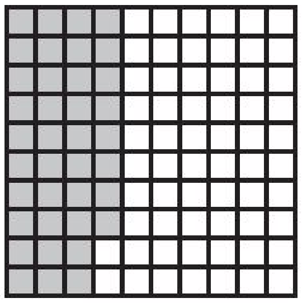
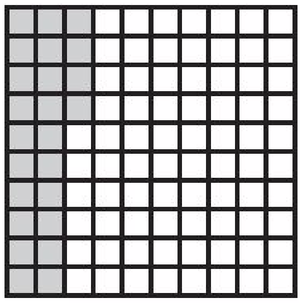
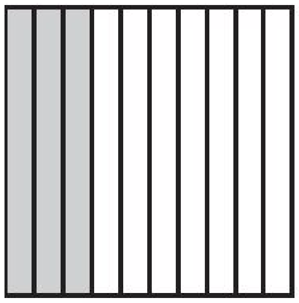
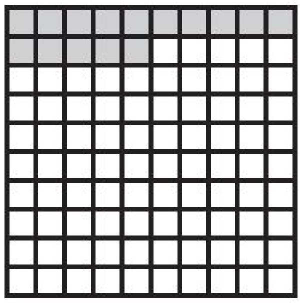
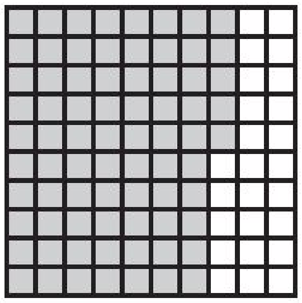
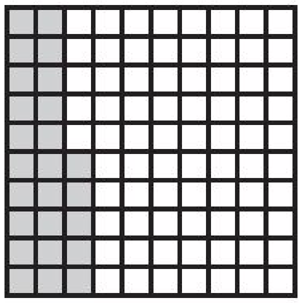
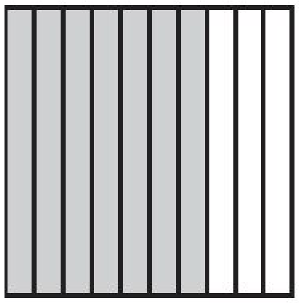


Unit 10, Lesson 8

Model Comparisons

Decimal Battle Cards

Instructions: Print the Decimal Battle Cards on paper and cut each model apart. Create one deck for each set of partners in half of your class.

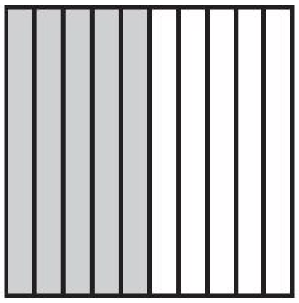
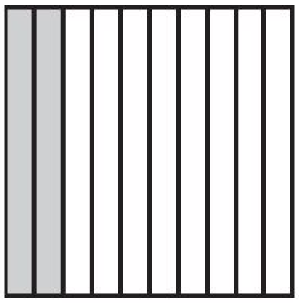
	
	
	
	

Unit 10, Lesson 8

Model Comparisons

Decimal Battle Cards, *continued*

Instructions: Print the Decimal Battle Cards on paper and cut each model apart. Create one deck for each set of partners in half of your class.

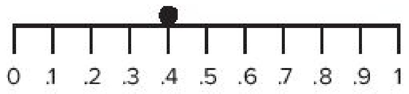
	
0.45	0.6
0.33	0.1
0.78	0.82

Unit 10, Lesson 8

Model Comparisons

Decimal Battle Cards, *continued*

Instructions: Print the Decimal Battle Cards on paper and cut each model apart. Create one deck for each set of partners in half of your class.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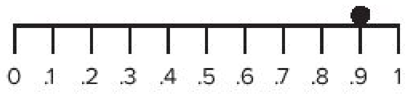
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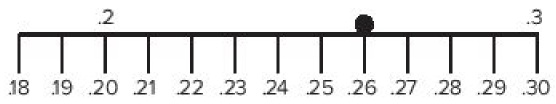
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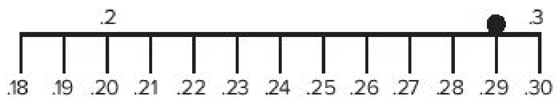
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Unit 10, Lesson 12
Putting the Pieces Together

Fraction Addition Battle Cards

Instructions: Print the Fraction Addition Battle Cards on paper and cut each model apart. Create one deck for each set of partners in half of your class.

$\frac{2}{10} + \frac{30}{100} =$	$\frac{56}{100} + \frac{3}{10} =$
$\frac{8}{10} + \frac{75}{100} =$	$\frac{8}{100} + \frac{4}{10} =$
$\frac{73}{100} + \frac{3}{10} =$	$\frac{22}{100} + \frac{5}{10} =$
$\frac{45}{100} + \frac{9}{10} =$	$\frac{67}{100} + \frac{2}{10} =$
$\frac{9}{10} + \frac{9}{100} =$	$\frac{9}{10} + \frac{9}{100} =$

Unit 10, Lesson 12
Putting the Pieces Together

Fraction Addition Battle Cards, *continued*

Instructions: Print the Fraction Addition Battle Cards on paper and cut each model apart. Create one deck for each set of partners in half of your class.

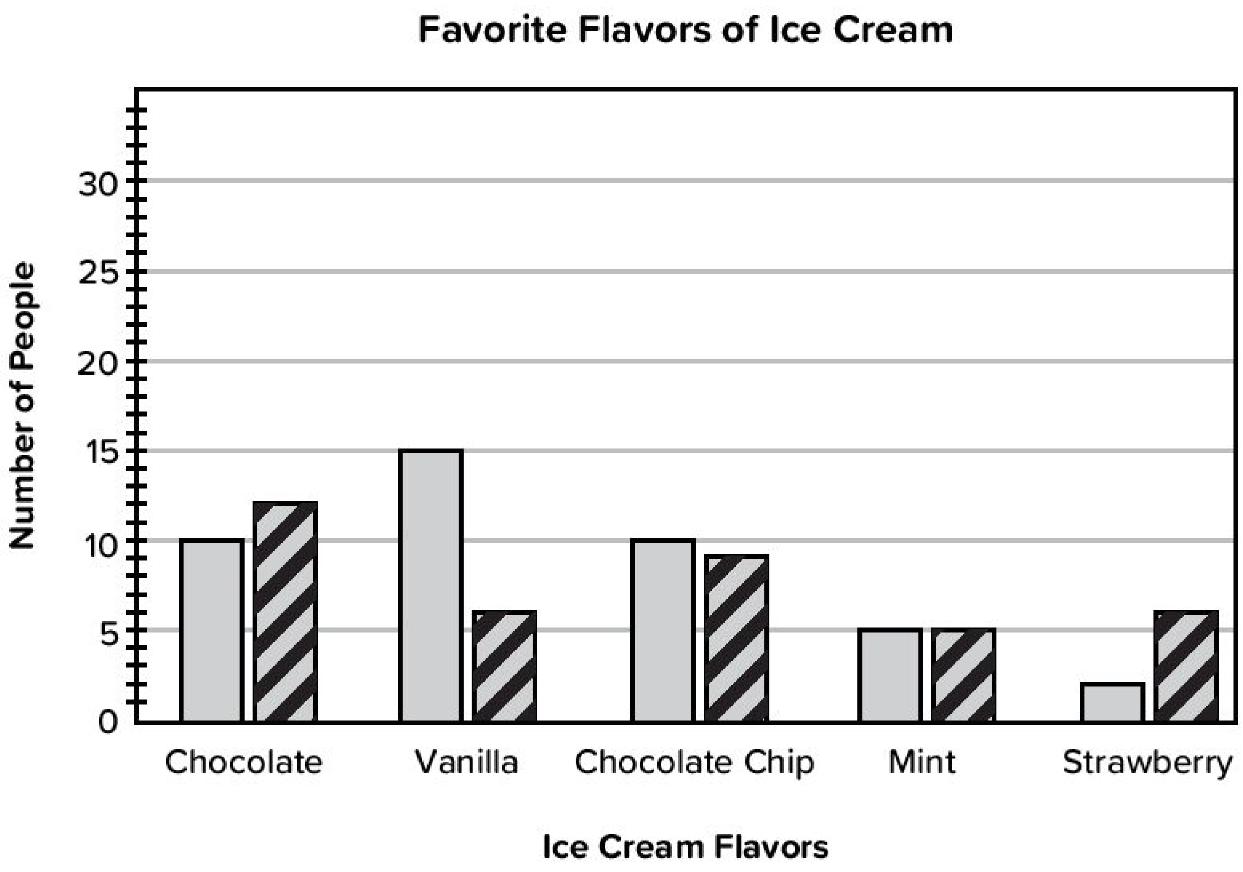
$\frac{2}{100} + \frac{5}{10} =$	$\frac{12}{100} + \frac{9}{10} =$
$\frac{6}{10} + \frac{34}{100} =$	$\frac{7}{10} + \frac{30}{100} =$
$\frac{9}{10} + \frac{98}{100} =$	$\frac{6}{10} + \frac{100}{100} =$
$\frac{10}{10} + \frac{37}{100} =$	$\frac{8}{10} + \frac{9}{100} =$
$\frac{20}{10} + \frac{71}{100} =$	$\frac{6}{10} + \frac{60}{100} =$

Unit 11, Lesson 1

Show Me the Data

Favorite Flavors of Ice Cream Poster

Instructions: Print a large copy or create a large version of this graph to display on the board.

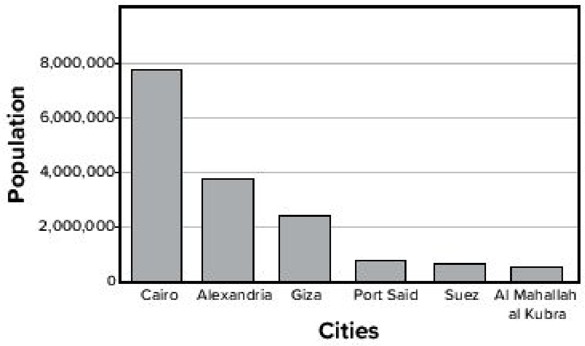


Unit 11, Lesson 4
Data About Us

Graph Sorting Cards

Instructions: Photocopy one set for each student. Students will cut cards apart.

Population of Major Egyptian Cities



This table shows the bike sales for a store during the first four months of two years.

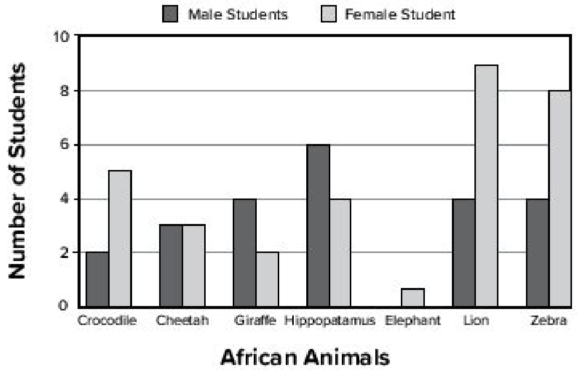
	January	February	March	April
2020	40	33	56	72
2021	30	23	56	70

Number of Siblings	Tally Marks	Total
0	𝍷	1
1	𝍷𝍷𝍷𝍷	4
2	𝍸	5
3	𝍸𝍷𝍷	7
4	𝍷𝍷	2
5	𝍷	1

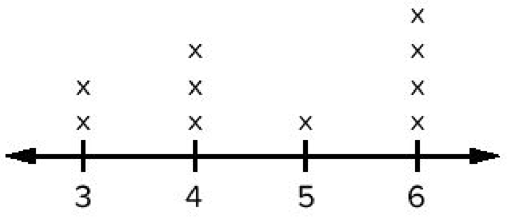
Eight friends made new bracelets. The lengths were: 15.5 cm; 20 cm; 15 cm; 20.5 cm; 15.5 cm; 15 cm; 15 cm; 20 cm

How could they represent the data?

Students' Favorite African Animal



Number of Days Spent at the Beach



Unit 11, Lesson 4
Data About Us

Graph Sorting Cards, *continued*

Instructions: Photocopy one set for each student. Students will cut cards apart.

Favorite Season	Tally Marks	Total
Winter	𝍸 𝍸 ||	12
Spring	𝍸 𝍸 𝍸	15
Summer	|||	3
Fall	𝍸 𝍸 𝍸 ||	17

This type of graph is used to compare things between different groups or to track change over large periods of time.

This type of graph is used to display two sets of data on the same graph.

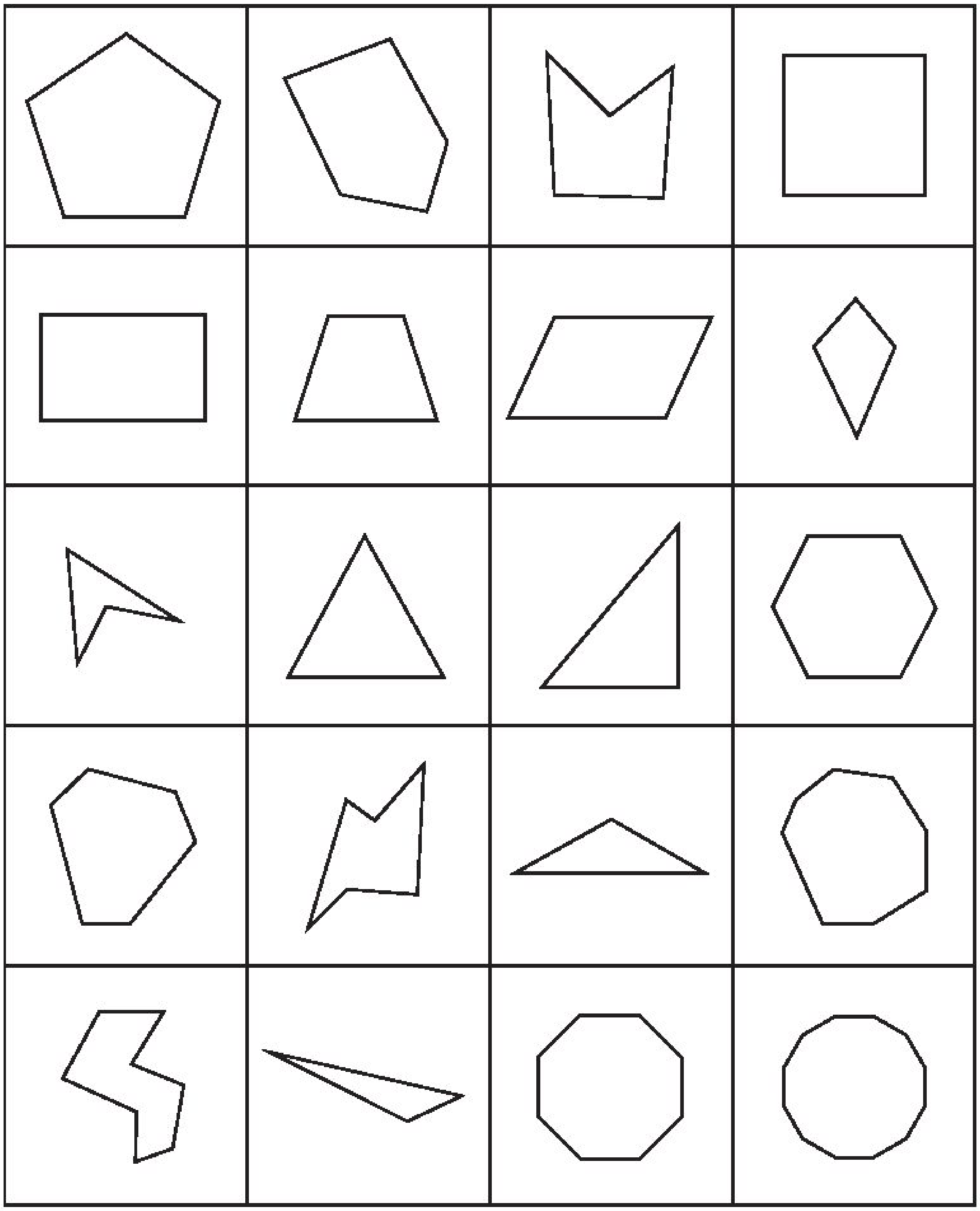
This type of graph is used to show the frequency of data on a number line.

Unit 12, Lesson 1

Two-Dimensional Shapes

2-Dimensional Shape Cards

Instructions: Photocopy one set for each group of 4 students.
Have students cut cards apart.

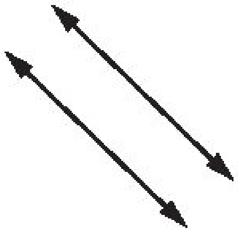
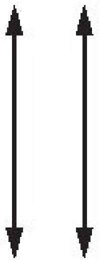
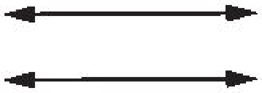
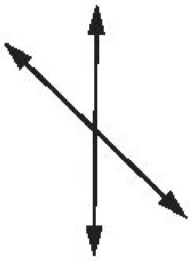
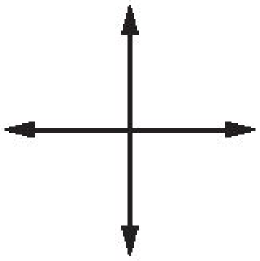
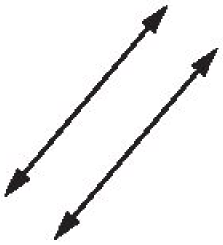
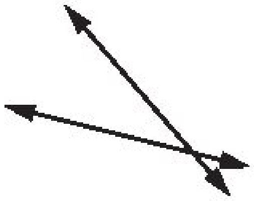
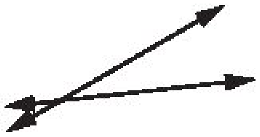
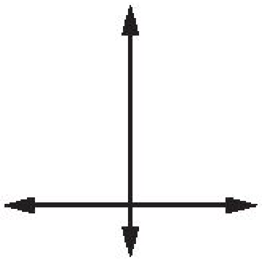
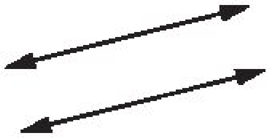
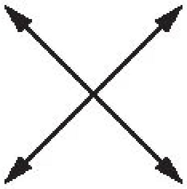
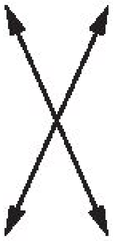


Unit 12, Lesson 3

Two-Dimensional Shapes

Line Sorting Cards

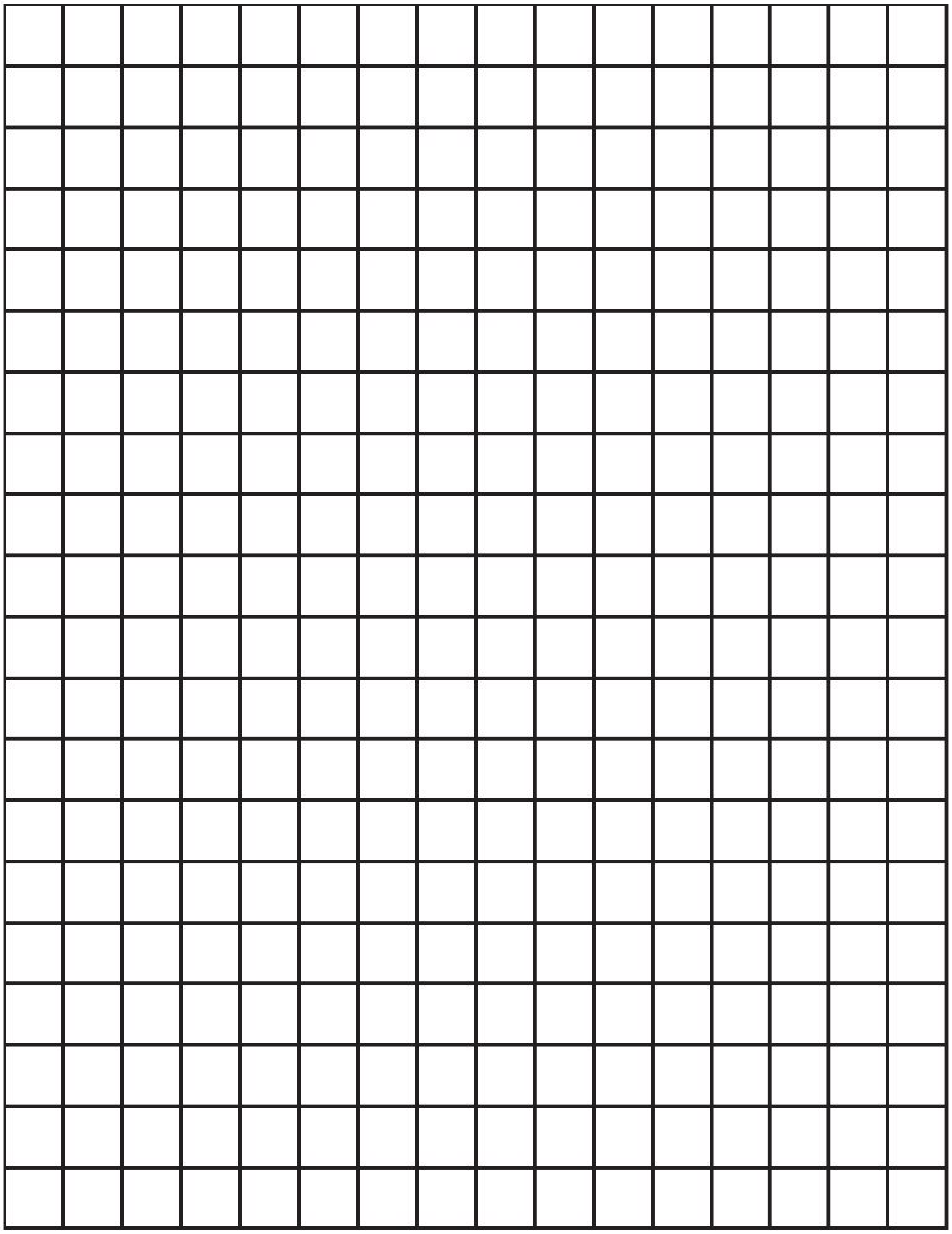
Instructions: Photocopy one set for each small group of 3 students. Have students cut cards apart.

A. 	**B.** 	**C.** 
D. 	**E.** 	**F.** 
G. 	**H.** 	**I.** 
J. 	**K.** 	**L.** 

Unit 12
(for Lessons 4, 7, and 8)

1-Centimeter Graph Paper

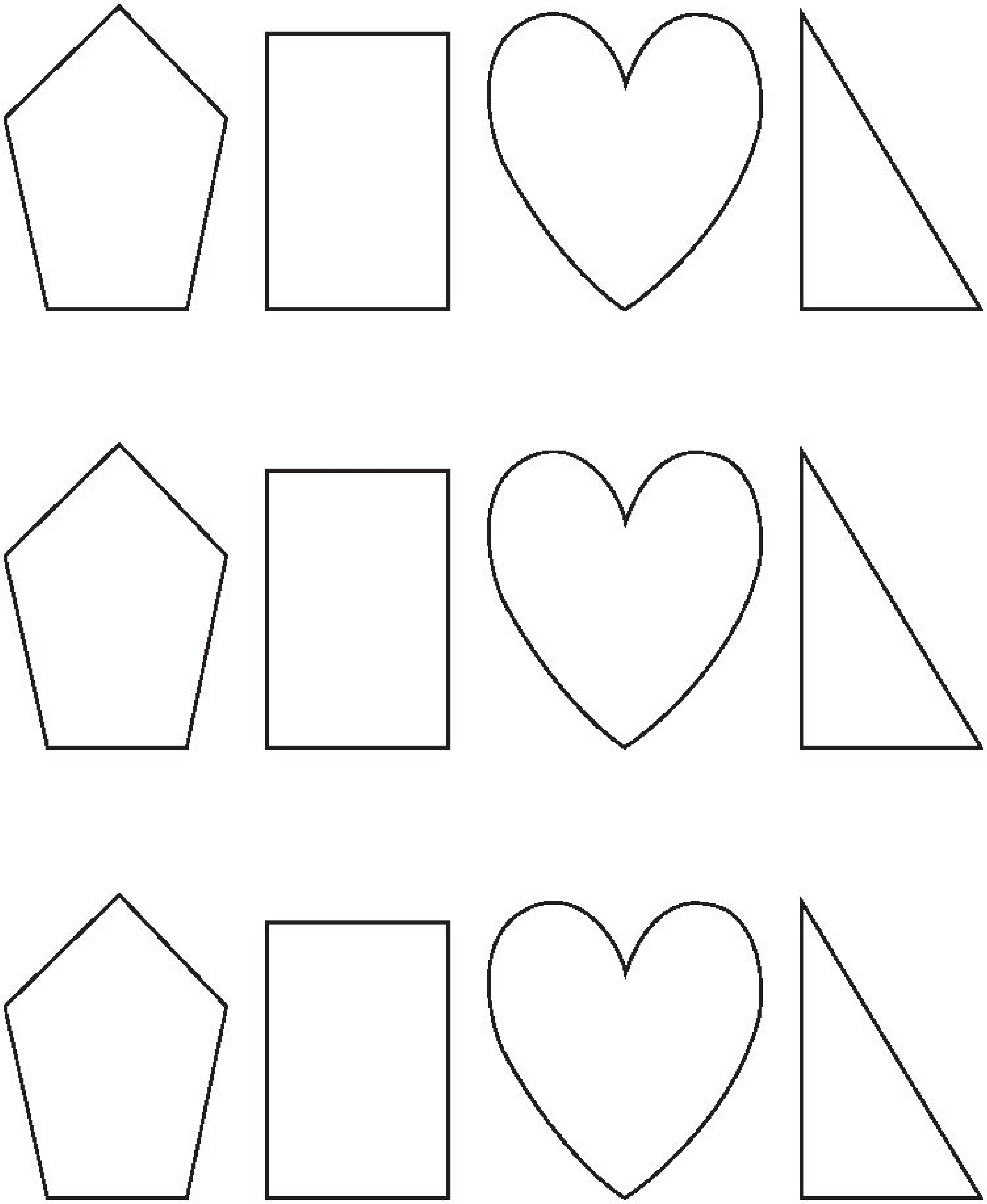
Instructions: Photocopy one sheet per student.



Unit 12, Lesson 5
What is Symmetry?

Folding Shapes

Instructions: Photocopy one set for each student.

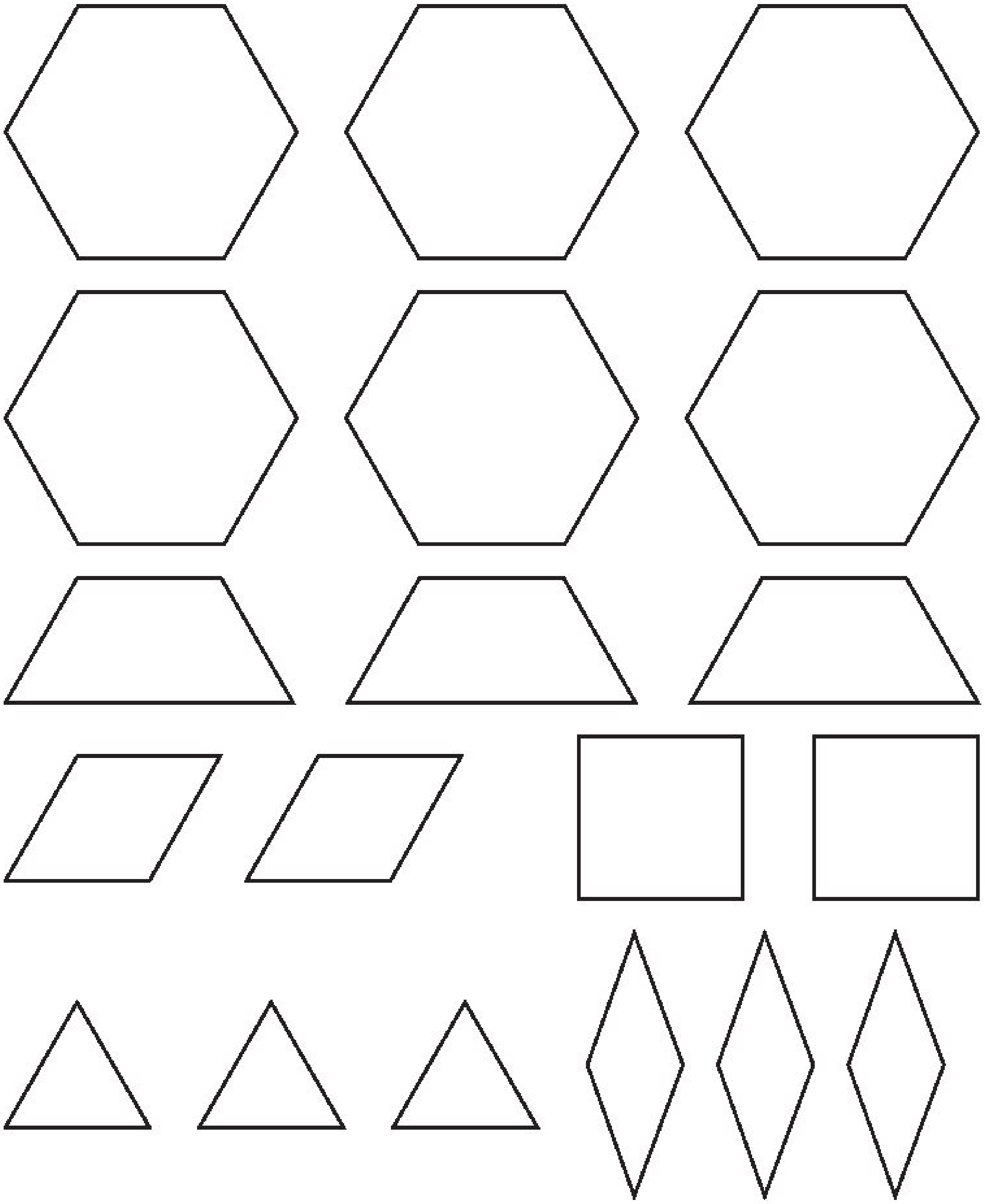


Unit 12, Lesson 6

Creating Symmetrical Images

Pattern Blocks

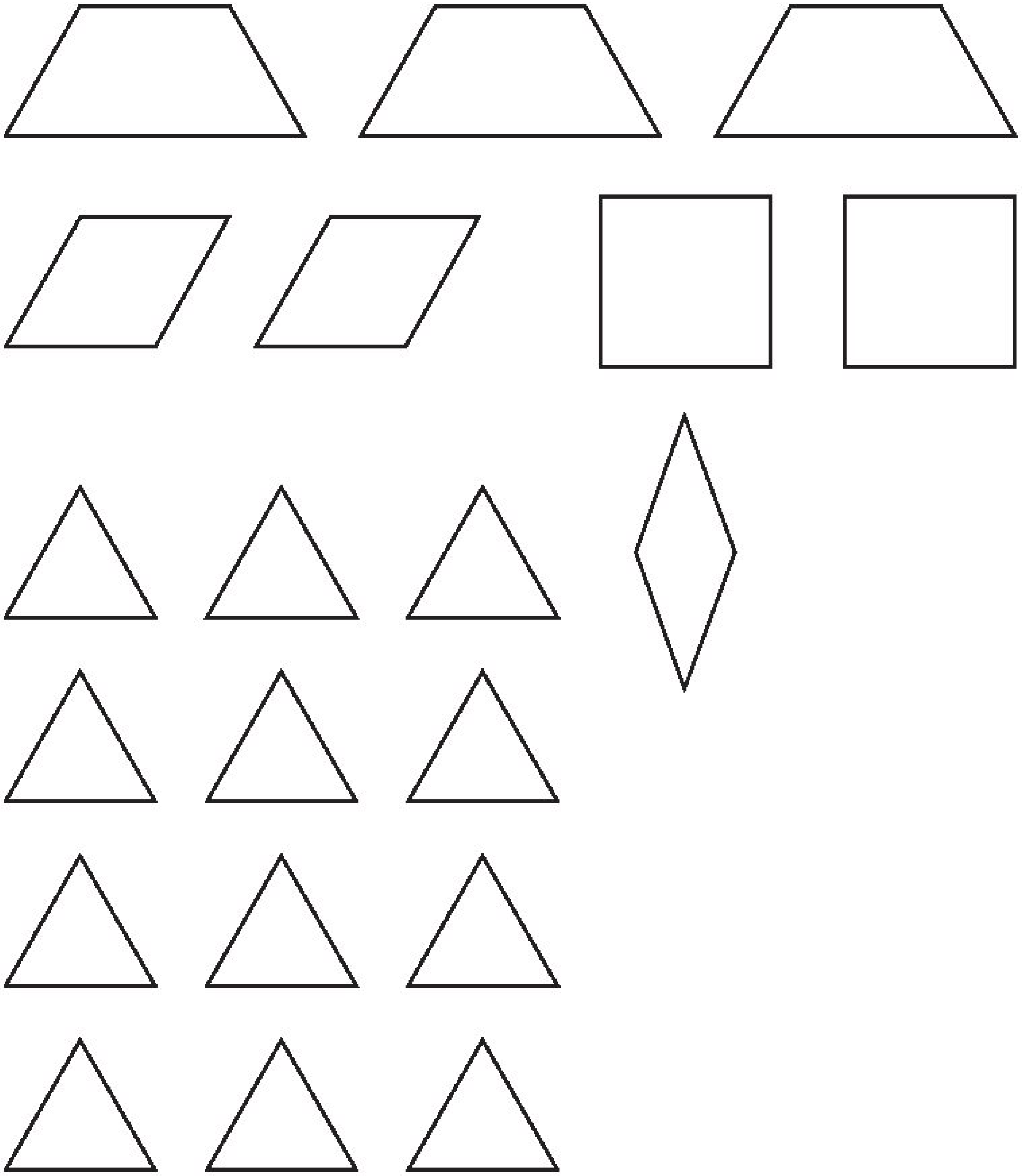
Instructions: Photocopy one set (two pages) per student.
Have students cut shapes apart.



Unit 12, Lesson 6
Creating Symmetrical Images

Pattern Blocks, *continued*

Instructions: Photocopy one set (two pages) per student.
Have students cut shapes apart.



Unit 12, Lesson 12

Drawing Triangles

Triangle Memory Match

Instructions: Photocopy one set of Group A and Group B cards for each small group of 4 students.

Group A

Scalene Triangle	Acute Triangle
Obtuse Triangle	Isosceles Triangle
Equilateral Triangle	Right Triangle

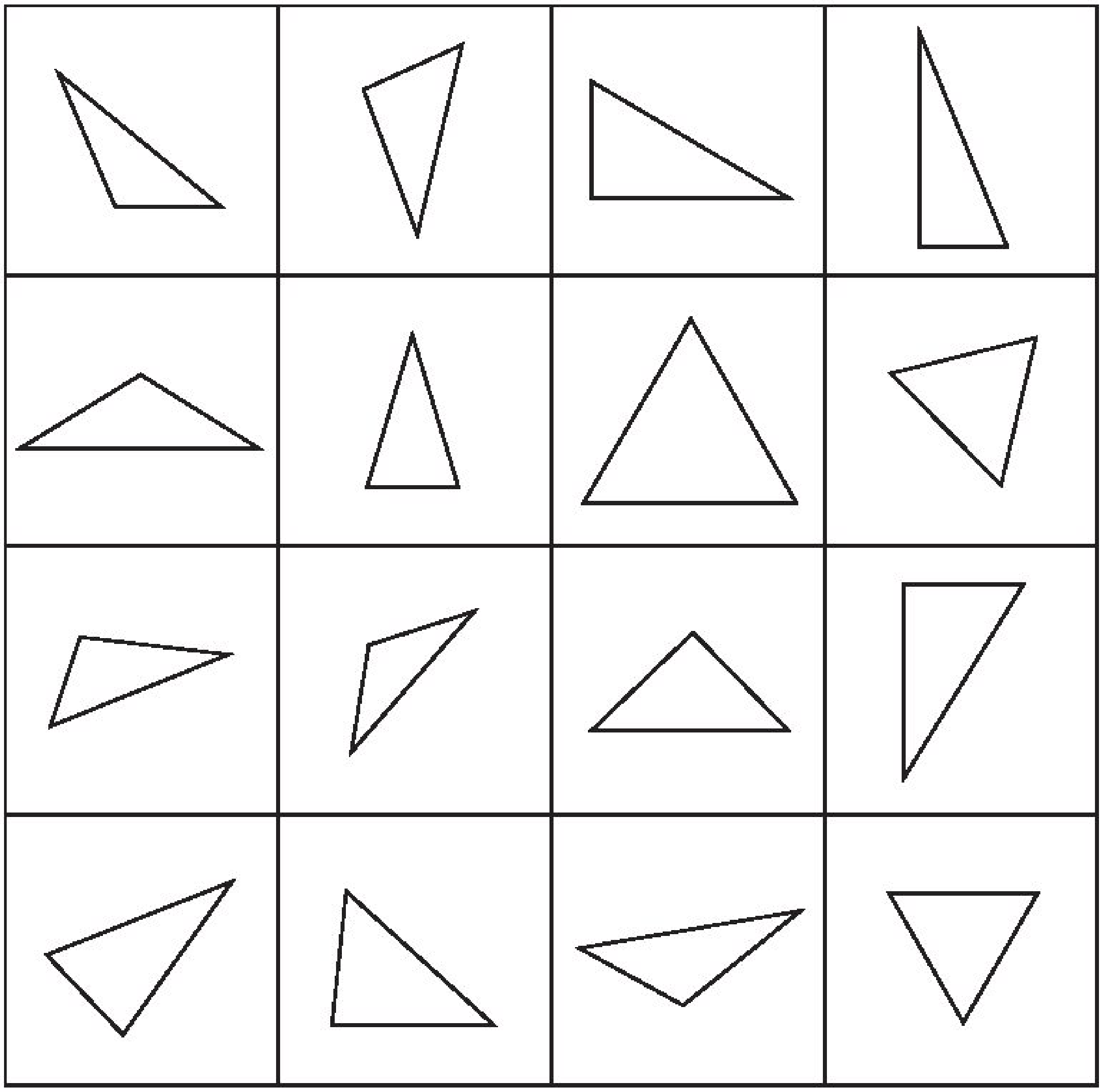
Unit 12, Lesson 12

Drawing Triangles

Triangle Memory Match, *continued*

Instructions: Photocopy one set of Group A and Group B cards for each small group of 4 students.

Group B

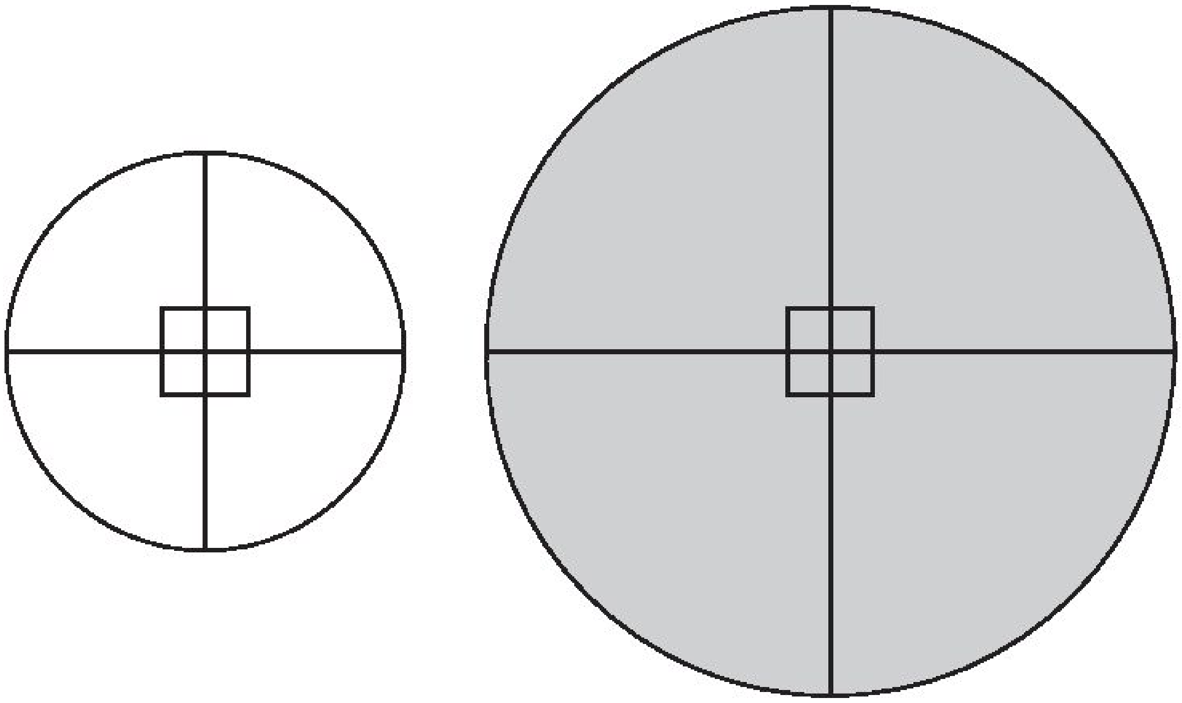


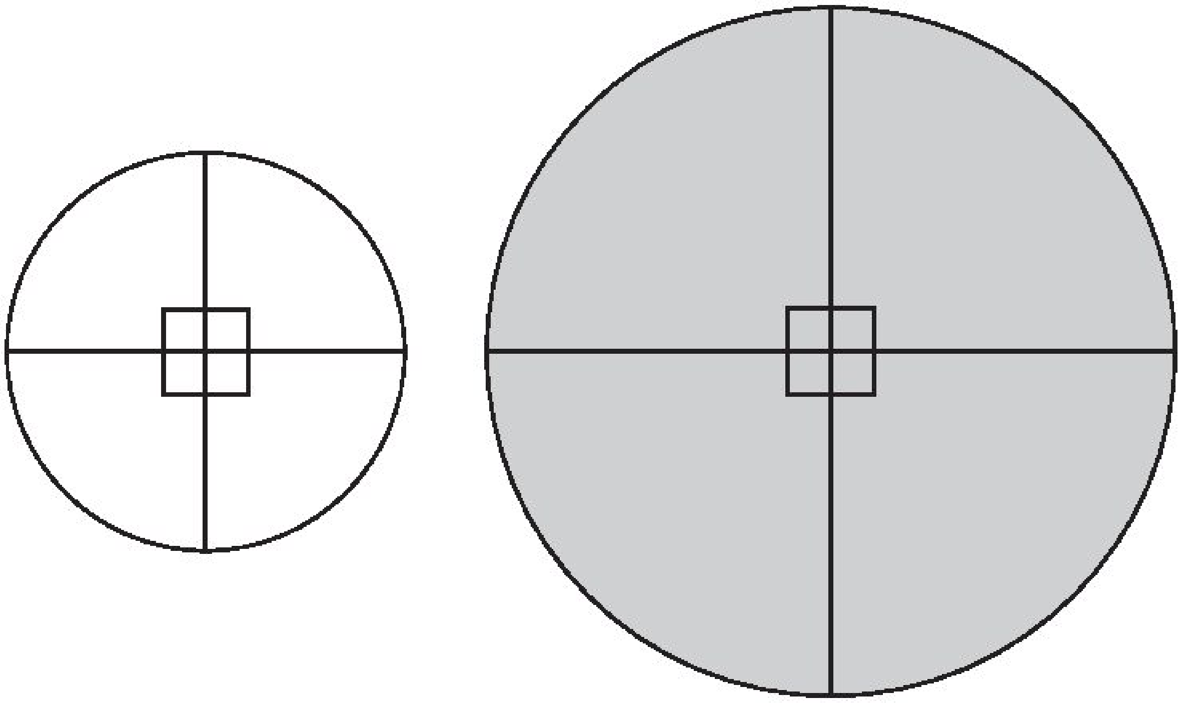
Unit 13, Lesson 2

Exploring Circle and Angle Relationships

Comparing Circles

Instructions: Photocopy one set of two circles for each group of 4 students.



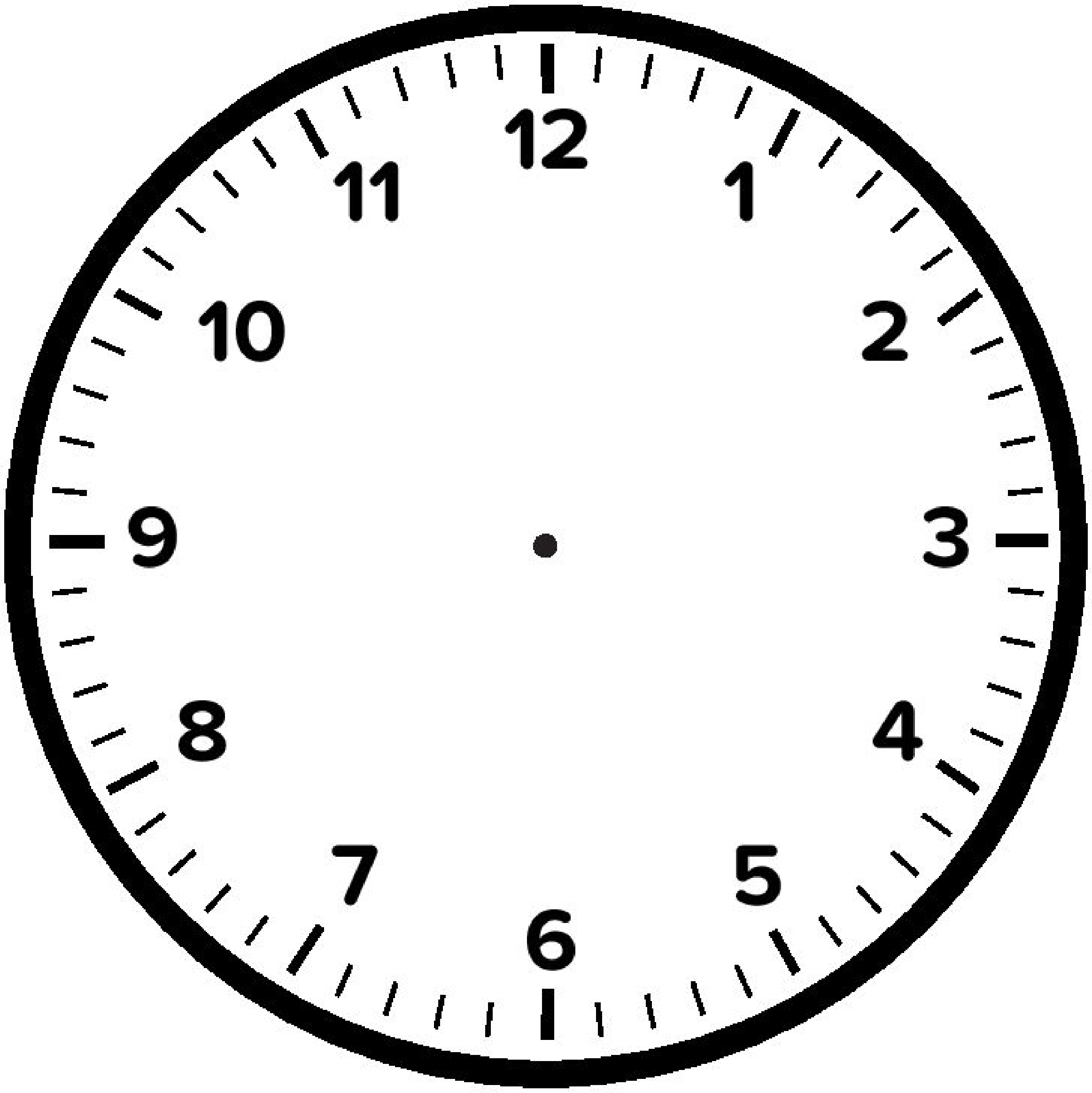


Unit 13, Lesson 4

Exploring Circle and Angle Relationships

Analog Clock Face — Large

Instructions: Photocopy one for teacher use.


12
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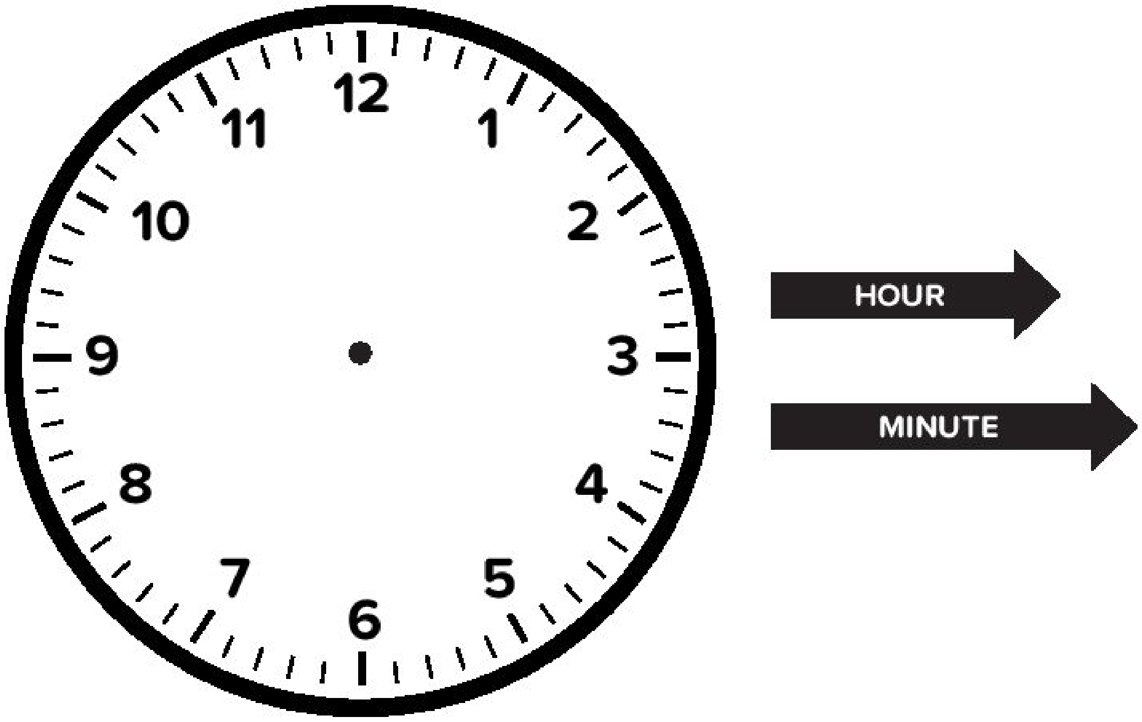
Unit 13, Lesson 4

Exploring Circle and Angle Relationships

Analog Clock Face — Small

Instructions: Photocopy one clock face and set of hands for each student.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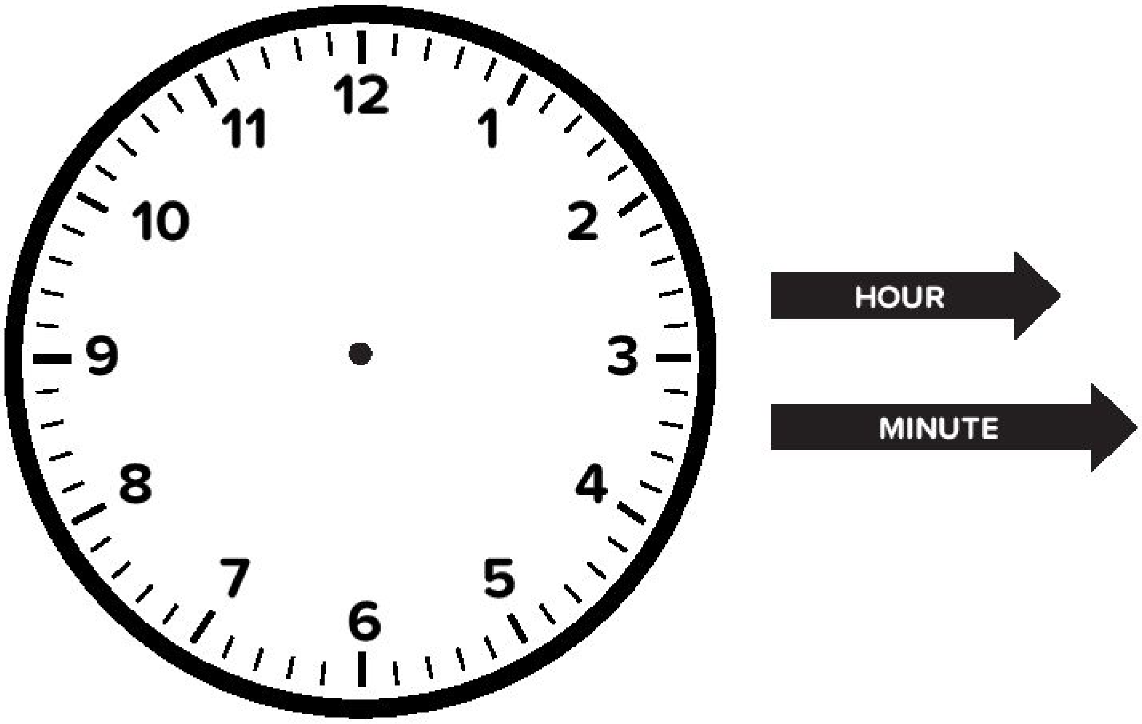
HOUR
MINUTE


12
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HOUR
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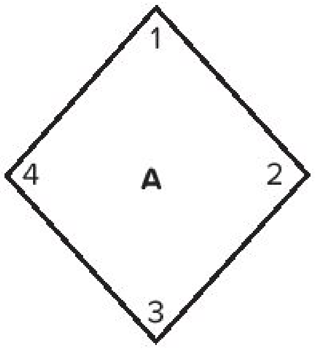
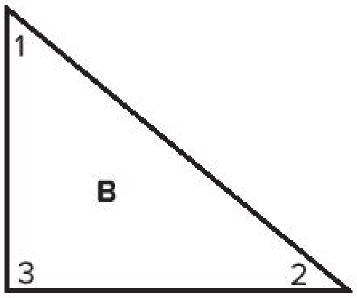
Unit 13, Lesson 5

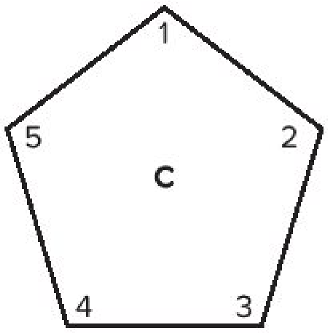
Using Paper Models to Measure and Draw Angles

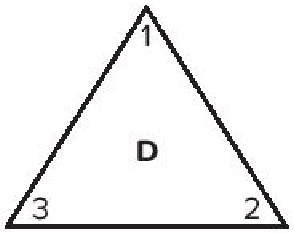
Paper Models

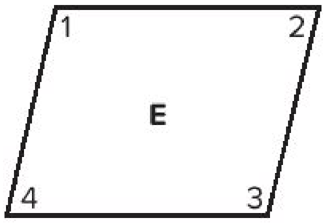
Instructions: Photocopy one set of shapes for each group of 4 students.
Have students cut apart.

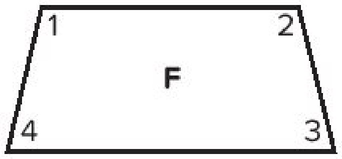


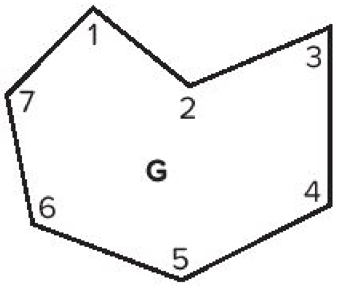


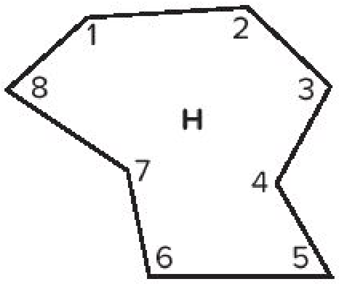


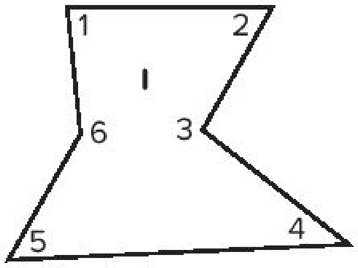


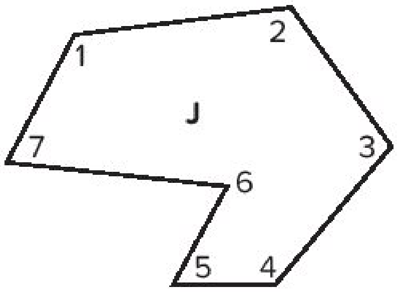


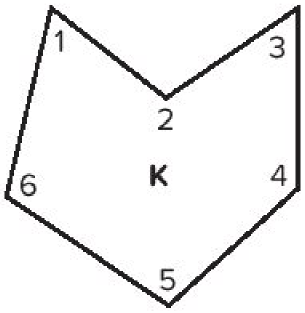


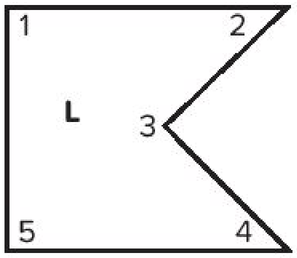










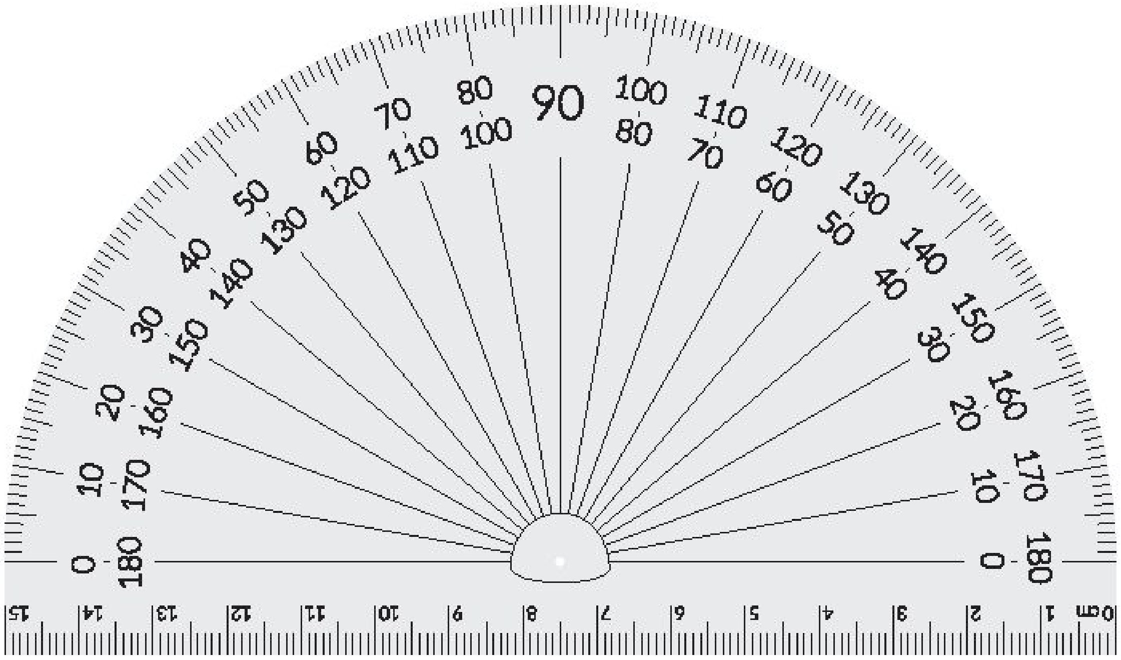


Unit 13, Lesson 6

Understanding Protractors

Paper Protractor

Instructions: Photocopy and carefully cut out one protractor for each student.



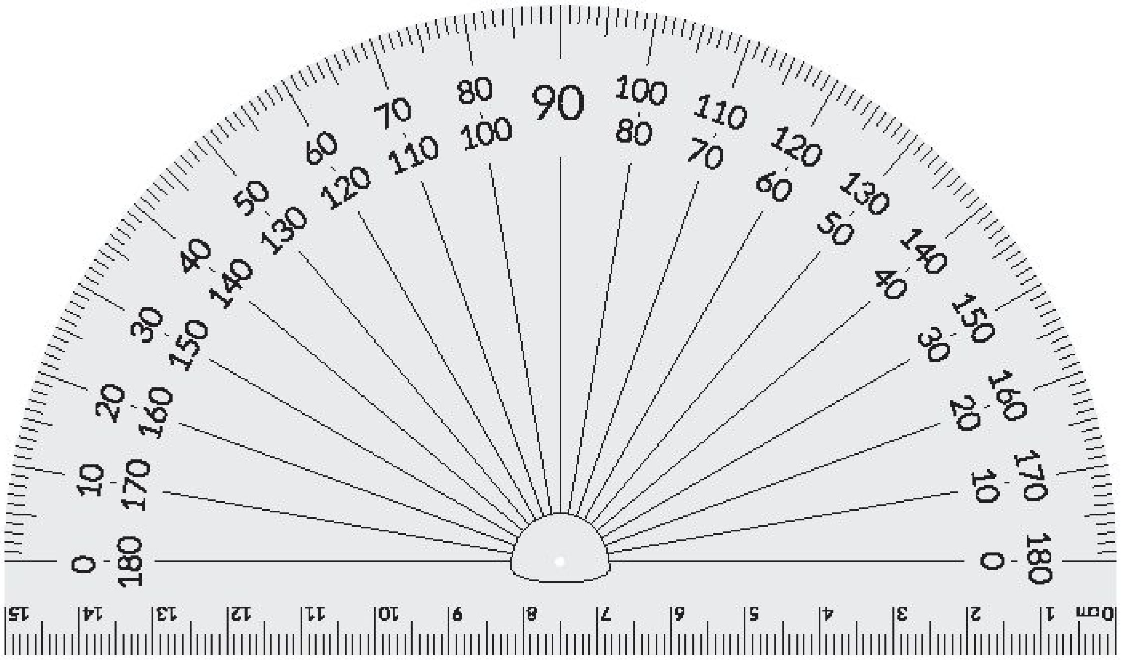
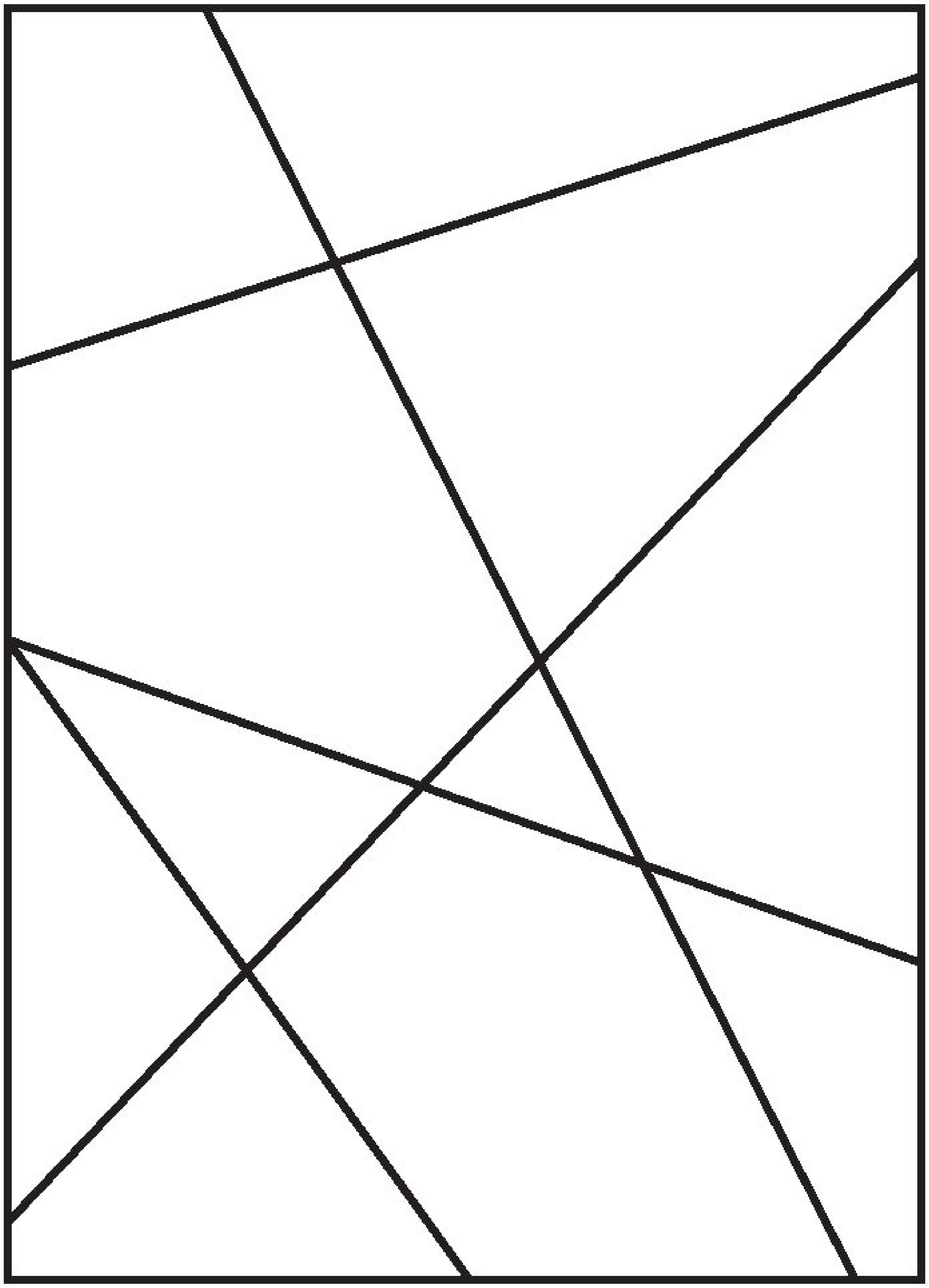


Photo credit: Oleksii Arseniuk / Shutterstock.com

Unit 13, Lesson 8
Measuring Angles, Part 2

Angle Map Model

Instructions: Show to students as a reference.



Glossary

A

a.m.

A time between 12:00 midnight and 12:00 noon.

acute angle

An angle with a measure less than 90°.

acute triangle

A triangle with no angle measuring 90° or more.

add

To combine or join together; put together two or more quantities.

addend

Any number being added. In the equation $6 + 8 = 14$, six and eight are both addends, 14 is the sum.

additive comparison

Problems that ask how much more (or less) one amount is than another.

Additive Identity Property of 0

When you add zero to a number, the sum is that same number.

algorithm

A step-by-step method for computing.

analyze

To study or examine something in detail.

angle

Two rays that share an endpoint.

angle measure

The measure of the size of an angle. It tells how far one side is turned from the other side. A one degree angle turns through $\frac{1}{360}$ of a full circle.

arc

Part of a circle's curve between any two of its points.

area

The measure, in square units, of the inside of a plane figure.

area model

A model of multiplication that shows each place value product.

array

An arrangement of objects in equal rows.

Associative Property of Addition

Changing the grouping of three or more addends does not change the sum.

Associative Property of Multiplication

Changing the grouping of three or more factors does not change the product.

attribute

A characteristic or property of an object, such as color, shape, size, and so on.

Glossary

B

bar model

A model that uses bars to represent known and unknown quantities and the relationship between these quantities.

base

Any side of a plane figure. Usually thought of as a side where the figure "sits."

Base Ten numeral form

A common way of writing a number using digits. The value of a numeral depends on where it appears in the number (also known as standard form, such as 12,356).

Base Ten numerals

Any of the symbols 0, 1, 2, 3, 4, 5, 6, 7, 8, or 9. The symbols can represent any amount based on a place value system of grouping by tens (also known as digits).

benchmark

A known size or amount that can be used as a reference to help understand a different size or amount. A benchmark can be used to estimate measurement.

benchmark fractions

Fractions that are commonly used for estimation. A benchmark fraction helps you compare two fractions. One-half, one-third, one-fourth, three-fourths, and two-thirds are all benchmark fractions.

C

capacity

The amount of liquid a container can hold.

centimeter (cm)

A metric unit of length equal to 0.01 $\left(\frac{1}{100}\right)$ of a meter.

circle

A plane figure with all points the same distance from a fixed point called a center.

classify

To sort into categories or to arrange into groups by attributes.

clockwise

The same direction in which the hands on a clock move.

common

Belonging to or shared by.

common denominator

For two or more fractions, a common denominator is a common multiple of the denominators. Three-fourths and two-fourths have four as a common denominator.

common factor

Any common factor of two or more numbers. Six is a common factor of both 12 and 24.

common multiple

Any common multiple of two or more numbers. Six is a common multiple of both 2 and 3.

common numerator

For two or more fractions, a common numerator is a common multiple of the numerators.

Commutative Property of Addition

Changing the order of the addends does not change the sum.

Commutative Property of Multiplication

Changing the order of the factors does not change the product.

compare

To decide if one number is greater than, less than, or equal to.

compatible numbers

Numbers that are easy to compute mentally and are close in value to the actual numbers. Compatible numbers can be used when estimating.

compose

To put together smaller numbers to make larger numbers.

composite number

A number greater than 0 that has more than two different factors.

congruent

Having exactly the same size and shape.

counterclockwise

The opposite direction from the direction that the hands move on a clock.

cup (c)

A customary unit of capacity.
1 cup = about 236.5 milliliters.

customary system

A system of measurement used in the United States. The system includes units for measuring length, capacity, and weight. Nearly everyone else uses the metric system.

D

data

A collection of information gathered for a purpose. Data may be in the form of either words or numbers.

Glossary

day

The length of time it takes the Earth to make a complete rotation. 24 hours = 1 day.

decimal

A number with one or more digits to the right of a decimal point. In 7.46, forty-six hundredths is the decimal or fraction of the whole.

decimal fraction

A fractional number with a denominator of 10 or a power of 10. It can be written with a decimal point.

decimal notation

Uses digits 0–9 and a decimal point. For example: 23.56 is in decimal notation.

decimal point

A dot (.) separating the whole number from the fraction (parts) in decimal notation.

decimeter (dm)

A metric unit of length. 1 decimeter = 0.1 meter; 10 decimeters = 1 meter. A hand span is about 1 decimeter.

decompose

To separate a number into two or more parts.

degree (angle measure)

A unit for measuring angles. It is based on dividing one complete circle into 360 equal parts. A one degree angle = $\frac{1}{360}$ of a circle.

determine

To decide or settle upon, figure out.

denominator

The quantity below the line in a fraction. It tells how many equal parts are in the whole.

diagonal

A line that goes through vertices of a polygon that are not next to each other.

difference

The amount that remains after one quantity is subtracted from another. The answer in a subtraction problem.

display

To show, exhibit, or demonstrate.

digit

Any of the symbols 0, 1, 2, 3, 4, 5, 6, 7, 8, or 9. (Also known as Base Ten numerals.)

Distributive Property of Multiplication

When one of the factors of a product is a sum, multiplying each addend before adding does not change the product.

divide

To separate into equal groups and find the number in each group or the number of groups. 56 split into 8 equal groups equals seven in each group, 56 ÷ 8 = 7

dividend

A number that is divided by another number. 56 is the dividend in the above example.

divisible

A number is divisible by another number if the quotient is a counting number without a remainder.

divisor

The number by which another number is divided. 8 is the divisor in 56 ÷ 8 = 7.

E

elapsed time

The amount of time that has passed (also known as time interval). Six hours elapse between 8:00 am and 2:00 pm.

endpoint

A point at either end of a line segment, or a point at one end of a ray.

equal

Having the same value. 2 feet = 24 inches

equation

A mathematical sentence with an equal sign. The amount on one side of the equal sign has the same value as the amount on the other side. 4 + 3 = 7

equivalent decimals

Decimals that have the same value. 0.7 = 0.70

equivalent fractions

Fractions that have the same value. $\frac{1}{2} = \frac{2}{4}$

estimate

To find a number close to an exact amount; an estimate tells *about* how much or *about* how many.

expanded form

A way to write numbers that shows the place value of each digit. 263 = 200 + 60 + 3

expression

A mathematical phrase without an equal sign. $n + 4$

F

fact family

A group of related facts that use the same numbers (also known as related facts). Fact family for 3, 5, 15: 3 × 5 = 15; 15 ÷ 5 = 3; 5 × 3 = 15; 15 ÷ 3 = 5

factors

The whole numbers that are multiplied to get a product. 6 × 7 = 42 (6 and 7 are factors.)

factor pairs

A set of two whole numbers that when multiplied will result in a given product. $2 \times 3 = 6$, $1 \times 6 = 6$. The factor pairs for 6 are: 2 and 3, 1 and 6.

fluid ounce (fl oz)

A customary unit of capacity.
1 fluid ounce = about 30 milliliters.

foot (ft)

A customary unit of length.
1 foot = about 30 centimeters.

formula

A rule that is written as an equation. $A = l \times w$

fraction

A way to describe a part of a whole or a part of a group by using equal parts.

fraction greater than one

A fraction with the numerator greater than the denominator. $\frac{6}{5}$

fraction less than one

A fraction with the numerator less than the denominator. $\frac{5}{6}$

G

gallon (gal)

A customary unit of capacity. 1 gallon = about 3.8 liters.

gram (g)

The standard unit of mass in the metric system. 1,000 grams = 1 kilogram. The mass of a paperclip is about 1 gram.

greater than >

Used to compare two numbers when the first number is larger than the second number.

H

half gallon

A customary unit of capacity.
1 half gallon = about 1.9 liters.

height

A perpendicular line segment from the base to the top of the figure.

hexagon

A polygon with six sides.

horizontal

Parallel to the horizon. Horizontal lines go from left to right or right to left.

hour (hr)

A unit of time. 1 hour = 60 minutes; 24 hours = 1 day.

Hundreds

The value of a digit that is the third position from the right when describing whole number place value.

hundredth

One of the equal parts when a whole is divided into 100 equal parts.

Hundredths

In the decimal numeration system, Hundredths is the name of the next place to the right of Tenths.

I

identify

Recognize or distinguish, figure out what it is, name it.

Identity Property of Multiplication

The property that states that the product of any number and 1 is that number: $n \times 1 = n$

inch (in)

A customary unit of length. 1 inch = about 2.5 centimeters.

intersecting lines

Lines that cross at a point.

inverse operations

Operations that undo each other. Multiplication and division are inverse operations. $8 \times 5 = 40$ and $40 \div 5 = 8$

interpret

To explain or tell the meaning of something.

J

justify

To show or prove to be right or reasonable.

K

kilogram (kg)

A metric unit of mass equal to 1,000 grams. 1 kilogram = about 2.2 pounds.

kilometer (km)

A metric unit of length equal to 1,000 meters.

L

length

How long something is. The distance from one point to another. Length is measured in units such as centimeters, meters, and kilometers. One dimension of a 2-dimensional or 3-dimensional figure.

less than <

Used to compare two numbers when the first number is smaller than the second number.

like denominators

Denominators in two or more fractions that are the same.

like numerators

Numerators in two or more fractions that are the same.

line

A set of connected points continuing without end in both directions.

line of symmetry

A line that divides a figure into two congruent halves that are mirror images of each other.

line plot

A diagram showing frequency of data on a number line.

line segment

A part of a line with two endpoints.

line symmetric figures

Figures that can be folded in half and its two parts match exactly.

line symmetry

What a figure has if it can be folded in half and its two parts match exactly.

liter (L)

The basic unit of capacity in the metric system. 1 liter = 1,000 milliliters.

lowest terms

When a fraction is expressed with the fewest possible pieces, it is in lowest terms (also known as simplest form).

M

mass

The amount of matter in an object, usually measured by comparing with an object of known mass. While gravity influences weight, it does not affect mass.

mental math or mental calculation

Calculations that are done in a student’s head without pencil and paper, calculators, or other aids.

meter (m)

A standard unit of length in the metric system.

metric system

A system of measurement based on tens. The basic unit of capacity is the liter. The basic unit of length is the meter. The basic unit of mass is the gram.

mile (mi)

A customary unit of length. 1 mile = about 1.6 kilometers.

milliliter (mL)

A metric unit of capacity. 1,000 milliliters = 1 liter. This holds about 10 drops or 1 milliliter.

millimeter

A metric unit of length.
1,000 millimeters = 1 meter.

minute (min)

A unit used to measure a short amount of time. There are 60 minutes in one hour.

mixed number

A number that has a whole number and a fraction.

model or visual model

A picture or representation of a solution, a number, or a concept.

month

A length of time equal to 28, 30, or 31 days.
12 months = 1 year.

multidigit

Having more than one digit (number). Seven (7) is a single digit, whereas seventy-two (72) or seven hundred forty-two (742) are a multidigit numbers.

multiple

A product of a given whole number and any other whole number. 12 is a multiple of 3 and 4 because 3 × 4 = 12.

multiplicative comparison

A way to compare quantities using multiplication, as in “This tree is 3 times shorter than that tree.”

multiply

The operation of repeated addition of the same number. $3 \times 5 = 5 + 5 + 5$

N

number

The quantity we associate with a numeral. Often used interchangeably with digit and numeral.

number line

A diagram that represents numbers as points on a line.

number names

A way of using words to write a number (also known as word form).

numeral

Represents the idea of a number. The numeral 153 is composed of digits 1, 5, and 3. Often used interchangeably with digit and number.

numerator

The number written above the line in a fraction. It tells how many equal parts are described in the fraction.

O

obtuse angle

An angle with a measure greater than 90° but less than 180°.

obtuse triangle

A triangle that contains one angle with a measure greater than 90° (obtuse angle) and two acute angles.

Ones

The value of a digit that is farthest to the right when describing whole number place value.

order

A sequence or arrangement of things.

Order of Operations

A set of rules that tells the order in which to compute.

1. Do operations in parentheses.
2. Multiply and divide in order from left to right.
3. Add and subtract in order from left to right.

ounce (oz)

A customary unit of weight equal to $\frac{1}{16}$ of a pound. 1 ounce = about 28 grams.

P

p.m.

The time between 12:00 noon and 12:00 midnight.

parallel lines

Lines that are always the same distance apart. They do not intersect.

parallelogram

A quadrilateral with two pairs of parallel and congruent sides.

parentheses

Used in mathematics as grouping symbols for operations. When simplifying an expression, the operations within the parentheses are performed first.

partial product

A method of multiplying in which the value of each digit in a factor is multiplied separately, and then the partial products are added together.

partial quotient

A method of dividing in which multiples of the divisor are subtracted from the dividend, and then the partial quotients are added together.

pattern

A repeating or growing sequence or design. An ordered set of numbers or shapes arranged according to a rule.

perimeter

The distance around the outside of a figure.

period

In a large number, periods are groups of 3 digits separated by commas or by spaces.

perpendicular lines

Two intersecting lines that form right angles.

pint (pt)

A customary unit of capacity. 1 pint = about 0.47 liters.

place value

The value of the place of a digit in a number.

plane figure

A two-dimensional figure.

point

The exact location in space, represented by a dot.

polygon

A closed two-dimensional shape with 3 or more sides.

pound

A customary unit of weight.
1 pound = about 0.45 kilograms.

prime number

A whole number greater than 1 that has exactly two different factors, 1 and itself.

product

The answer to a multiplication problem.
In 6 × 7 = 42, 42 is the product/answer.

protractor

A tool used to measure and draw angles.

Q

quadrilateral

A polygon with four sides.

quart (qt)

A customary unit of capacity. 1 quart = about 1 liter.

quotient

The answer to a division problem.

R

range

The difference between the highest and lowest values.

ray

A part of a line that has one endpoint and goes on forever in one direction.

reasonableness

An answer that is based on good number sense.

rectangle

A quadrilateral with two pairs of congruent, parallel sides and four equal angles.

recognize

Identify (someone or something) from having encountered them before; know again, remember.

regroup

To rearrange numbers into groups of 10 when performing mathematical operations.

regular polygon

A polygon with all sides the same length and all angles the same measure.

related facts (fact family)

Related addition and subtraction facts or related multiplication and division facts. Related facts for 3, 5, 8: 3 + 5 = 8; 8 – 5 = 3; 5 + 3 = 8; 8 – 3 = 5 (also known as fact family).

remainder

The amount left over when one number is divided by another.

repeated subtraction

Subtracting equal groups to find the total amount of groups (also called division).

represent

To show or model.

rhombus

A quadrilateral with all four sides equal in length.

right angle

An angle that measures exactly 90°.

right triangle

A triangle that has one 90° angle.

round a whole number

To identify the nearest Ten, Hundred, Thousand, (and so on) and rename a number so it is easier to mentally add, subtract, multiply, or divide.

rule

Something that happens every time (for example: 2, 5, 8, 11 . . . the rule is +3).

S

second (sec)

A unit used to measure a very short amount of time. There are 60 seconds in one minute.

sequence

A set of numbers arranged in a special order or pattern.

simplest form

When a fraction is expressed with the fewest possible pieces, it is in simplest form (also known as lowest terms).

simplify

To express a fraction in simplest form.

sketch

A quick, rough drawing.

specify

Identify clearly and definitely.

square

A parallelogram with four equal angles and four equal sides.

square unit

A unit, such as square centimeter, used to measure area.

standard form

A common or usual way of writing a number using digits. 12,376 is in standard form.

straight angle

An angle that measures exactly 180°.

subtract

An operation that gives the difference between two numbers. Subtraction can be used to compare two numbers, or to find out how much is left after some is taken away.

sum

The answer to an addition problem.

T

Tens

The value of a digit that is the second position from the right when describing whole number place value.

tenth

One of the equal parts when a whole is divided into 10 equal parts.

Tenths

In the decimal numeration, tenths is the name of the place to the right of the decimal point.

Thousands

The value of a digit that is the fourth position from the right when describing whole number place value.

time interval

A duration of a segment of time (also known as elapsed time).

ton

A customary unit of weight. 1 ton (T) = 2,000 pounds. A metric ton, or tonne (t) is a unit of mass equal to 1,000 kilograms (about 2,200 pounds).

Glossary

trapezium

A quadrilateral with one pair of parallel sides and one pair of sides that are not parallel.

triangle

A polygon with three sides and three angles.

two-dimensional

Having length and width.

U

unit fraction

A fraction that has 1 as its numerator. A unit fraction names 1 equal part of a whole.

unlike denominators

Bottom numbers of a fraction that are not equal.

unlike numerators

Top numbers of a fraction that are not equal.

V

variable

A letter or symbol that represents a number. $5 \times b = 10$, b is a variable worth 2.

Venn diagram

A drawing with circles or rings to show how sets of objects are related.

vertex (plural: vertices)

The point at which two line segments, lines, or rays meet to form an angle.

vertical

Perpendicular to the horizon. Vertical lines go up and down.

volume

The number of cubic units it takes to fill a figure.

W

week

There are seven days in a week: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday.

weight

The measure of how heavy something is.

whole

All of an object, a group of objects, shape, or quantity.

whole numbers

The numbers 0, 1, 2, 3, and so on, without fractions or decimals.

width

One dimension of a 2-dimensional or 3-dimensional figure.

word form

A way of using words to write a number. The word form of 12,345 is twelve thousand, three hundred forty-five.

Y

yard (yd)

A customary unit of length. 1 yard = about 0.9 meters.

year

The length of time it takes the Earth to revolve around the sun. 12 months = 1 year;
365 days = 1 year; 366 days = 1 leap year.

Z

Zero Property of Multiplication

The product of any number and zero is zero.
$8 \times 0 = 0$